AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 15, 1955

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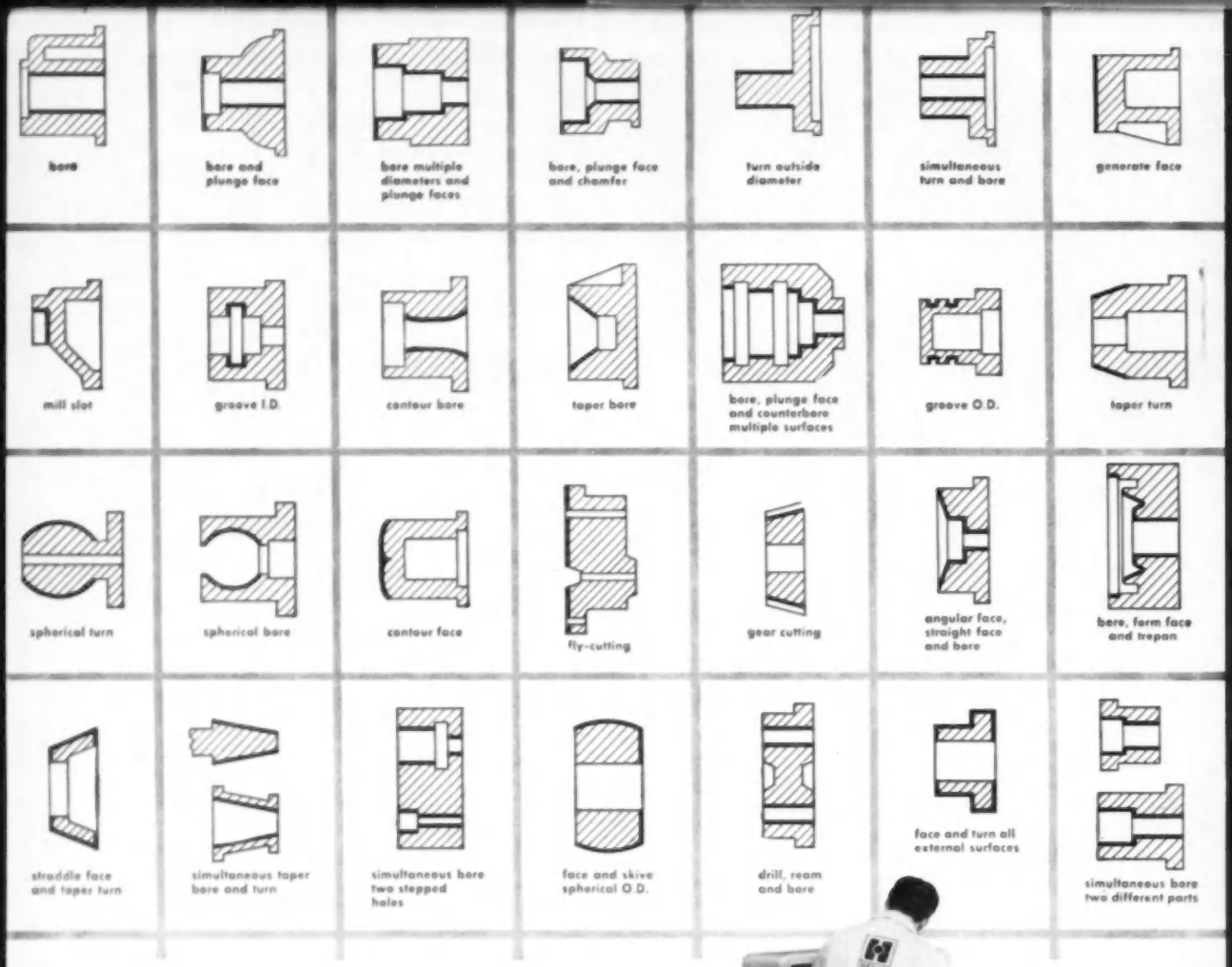

which of these operations can't be done on a Heald Bore-Matic?

With one exception, all of the operations shown here, plus many more, are routine for a Heald Bore-Matic—a *single-end* Heald Bore-Matic using a *single setting*, as a matter of fact!

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Turbocharged—185 hp

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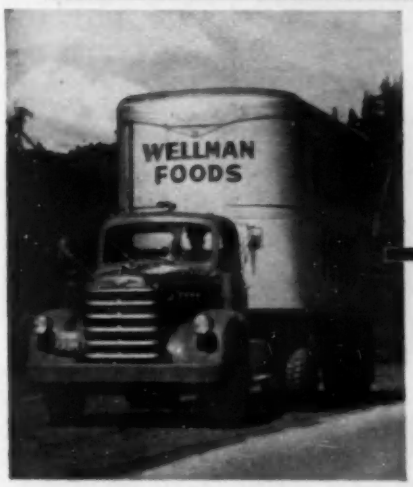

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WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

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But there are some things holding up their commercial production. Among them, high temperatures and corrosion.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

JUNE 15, 1955 — VOL. 112, NO. 12

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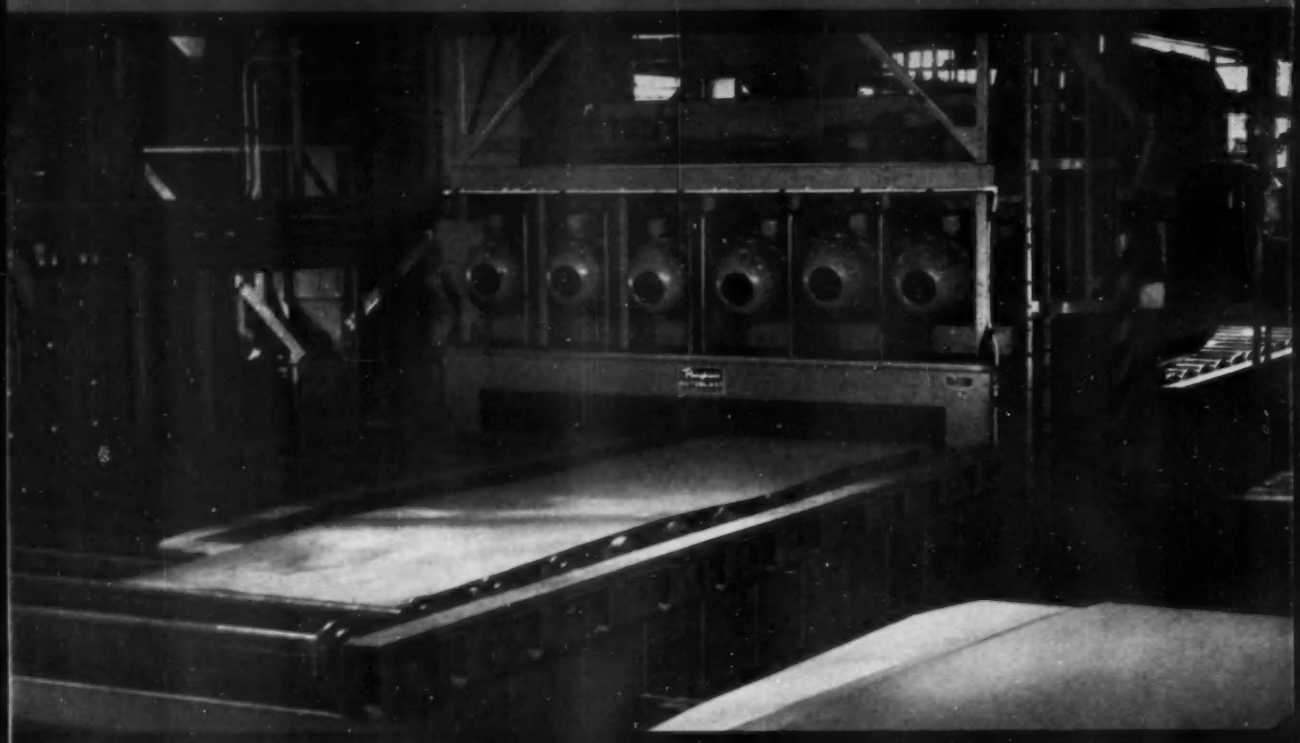
AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1928, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price, United States, United States Possessions, 1 year $3.00, 2 years $5.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00

Descale steel sheets, plates, coils



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For complete information, send for Bulletin 224. Write: PANGBORN CORPORATION, 3900 Pangborn Blvd., Hagerstown, Maryland.

*U. S. Pat. #2184926 (other patents pending)

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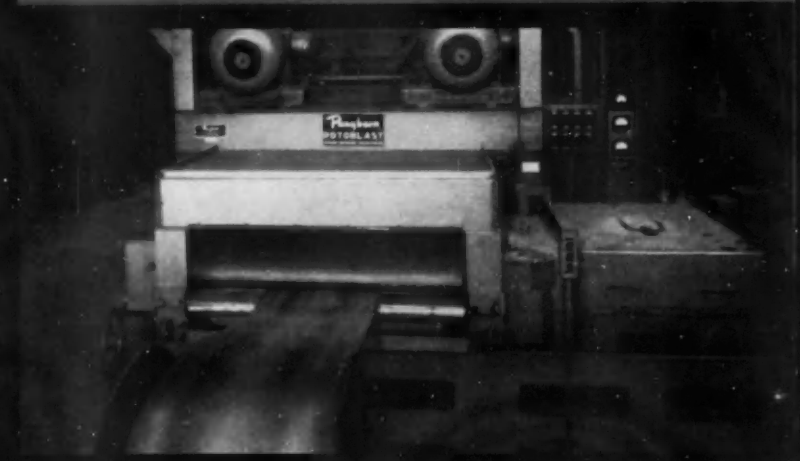

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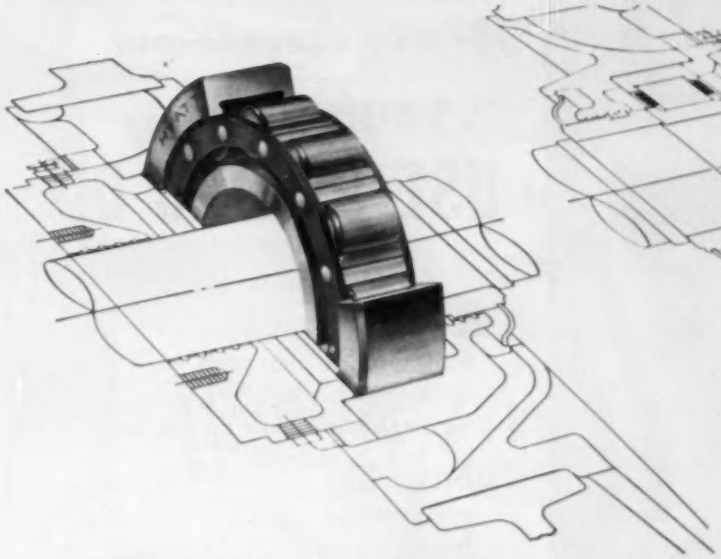

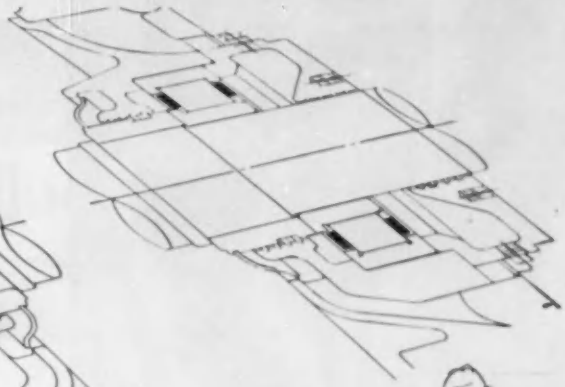

HY POTENUSE, the sage of the slide rule, says:

This HYATT Hy-Load is heading for a long hard life. It's been designed into as tough a job as you can hand any bearing—the armature shaft of a steel mill motor.

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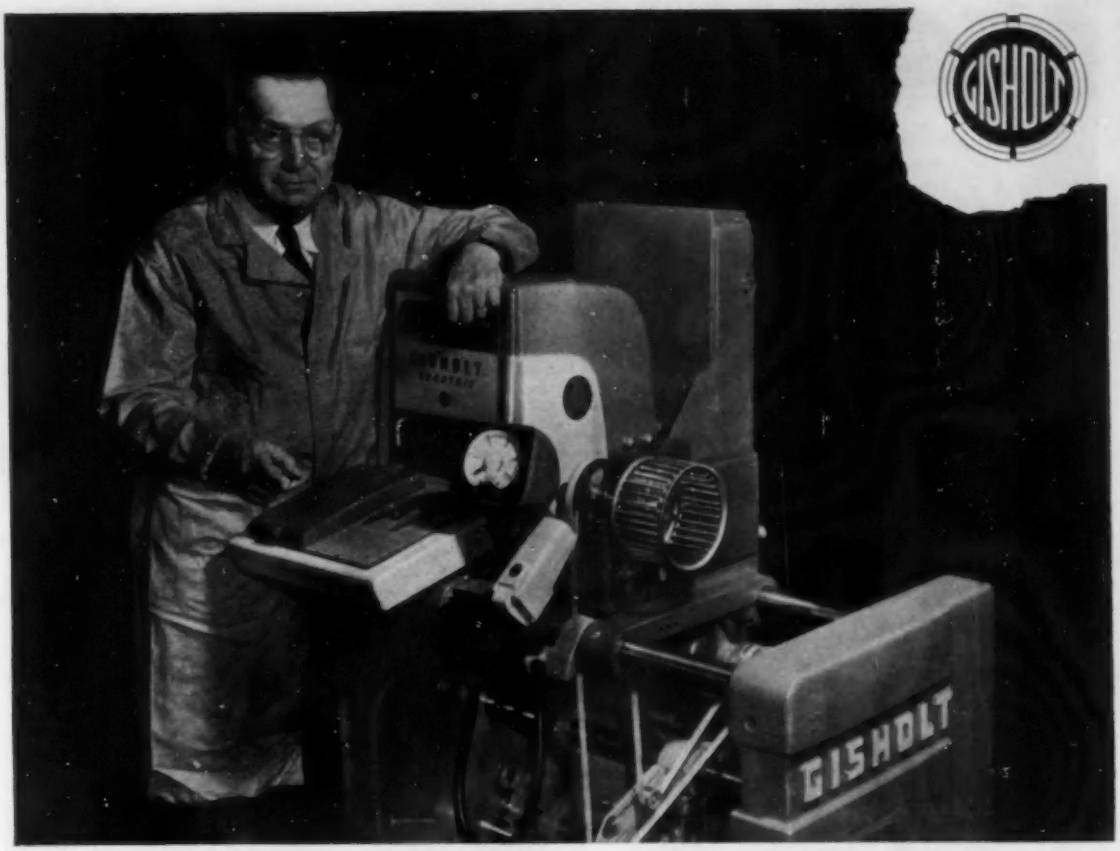

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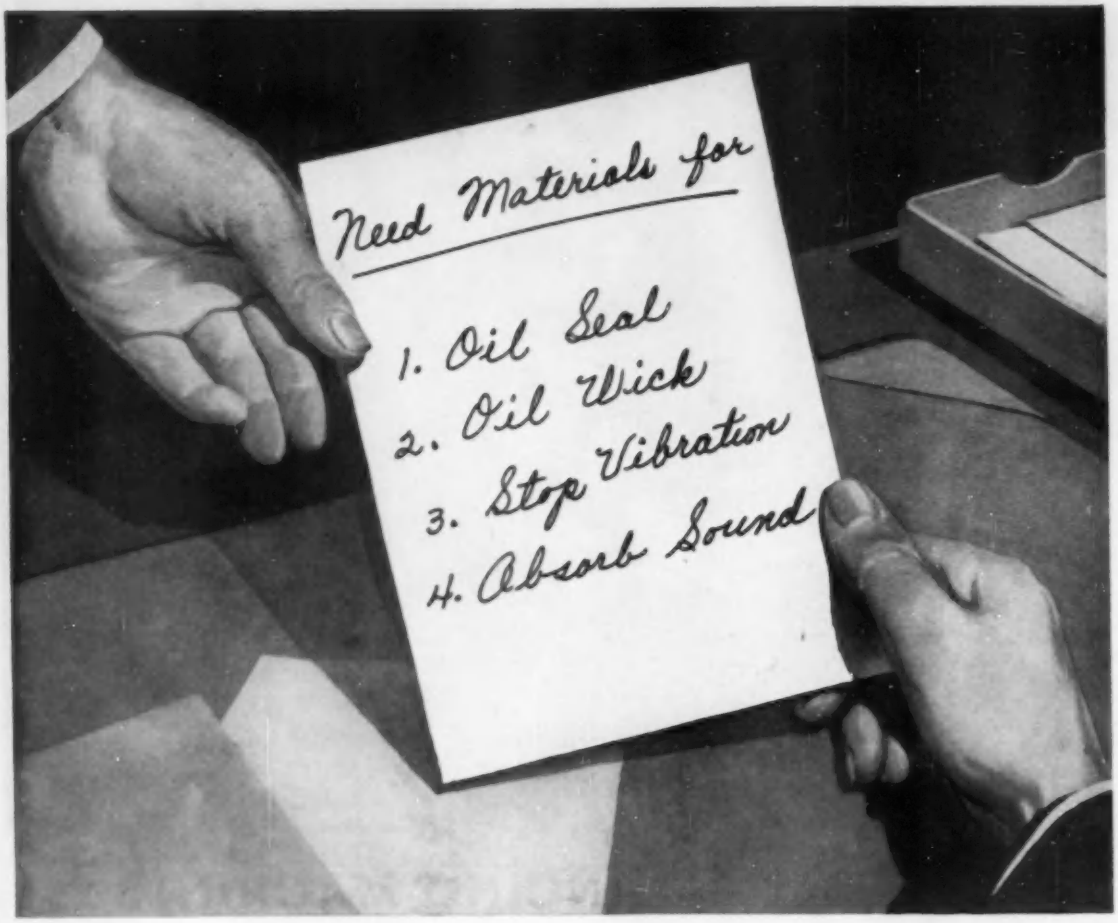

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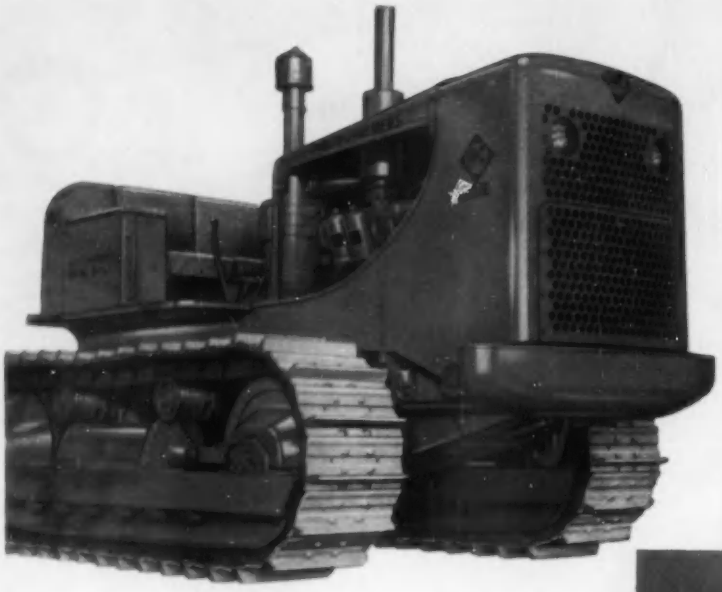

United Air Cleaner Protects New Allis-Chalmers Tractor

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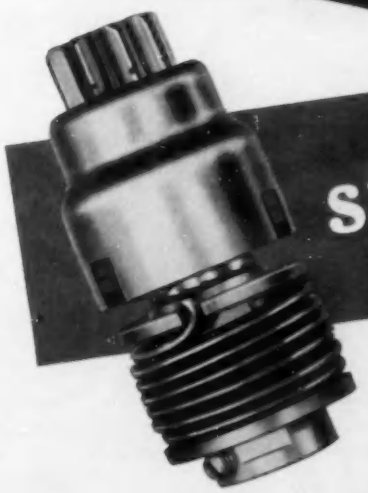

costs less. *Like the more than 95,000,000 Bendix® Starter Drives manufactured for the industry, the new Folo-Thru Drive requires no actuating linkage and the solenoid may be placed in any convenient position. Result is lower installation costs and no adjustments. Complete detailed information is available on request.*

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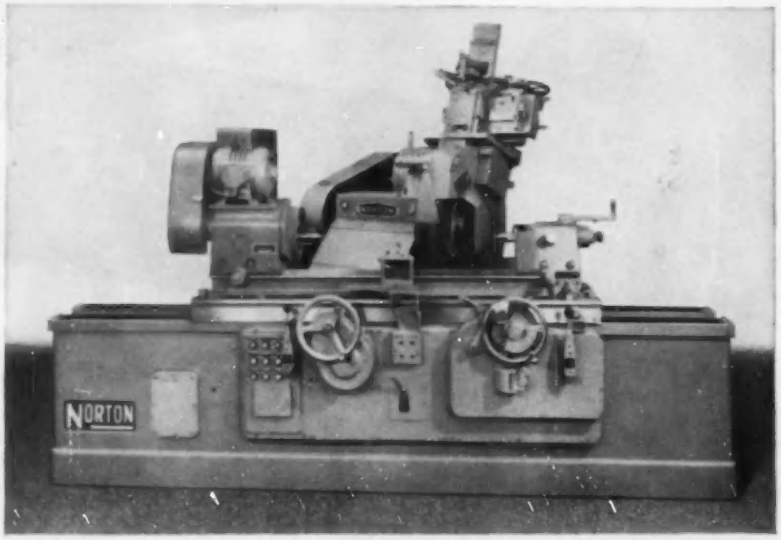
With the

Thrust Surface And Adjacent Diameter are both ground at once on the new Norton Type CV-4 semiautomatic wheel-slide grinder. And you get better quality results! Because this machine leaves a concentric grain pattern in the thrust surface finish — assuring a better seal surface and appearance than side wheel grinding can produce.



The Type CV-4 is available with hand table or hydraulic power table drive in swing capacities of 10" and 14", and work lengths of 18", 36", 48" or 72".

Norton Type CV-4 Semiautomatic Angular Wheelslide Grinder

you can do several grinding jobs at once

Now you can grind thrust surfaces and adjacent diameters in one automatic plunge grind operation! The new Norton Type CV-4 semiautomatic angular wheelslide grinding machine eliminates the separate operation on the shoulder or thrust surface that is normally necessary with conventional cylindrical grinders.

This alone means important savings in time and labor costs. And you get plenty of additional benefits from the Type CV-4's rapid grinding action, simplified operation and top-quality production.

Improved grinding wheel feed

The automatic wheel feed includes a "click-count" index, enabling settings for work diameter reduction in increments as fine as .0001" — instantly. Graduated wheel feed hand wheel, located to eliminate reaching, indicates amount of feed as it rotates. Both length and rate of automatic wheel feed easily adjusted from operating position.

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Operator merely loads; starts automatic cycle, and unloads. Fatigue is decreased, helping prevent production lag.

The automatic wheel guard truing device (optional) provides additional operating ease. Push-button control of straight, stepped or formed truing eliminates need of skill and reduces wheel cost per piece ground. In addition, the Type CV-4 can be easily adapted to special jobs with Norton-engineered chucking heads, locating and loading-assist equipment for greater productivity.

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Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.

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investigate the many advantages of the new Norton Type CV-4 semiautomatic angular wheelslide grinder. See your Norton Representative or write direct for Catalog. And remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

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That's why you find more and more new stamping lines made up completely of Danly Presses. You will find many reasons. Danly Presses are known for their extra rugged construction to withstand the stresses of continuous operation at full capacity; exclusive control arrangements facilitate automation; maintenance needs are decreased by automatic *oil* lubrication.

There's a great deal more to the Danly Press story, too — design and construction features that will make Danly Presses a must on your new line. Call a Danly engineer for a detailed discussion now.

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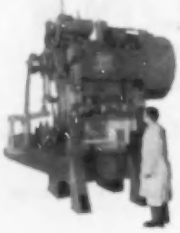
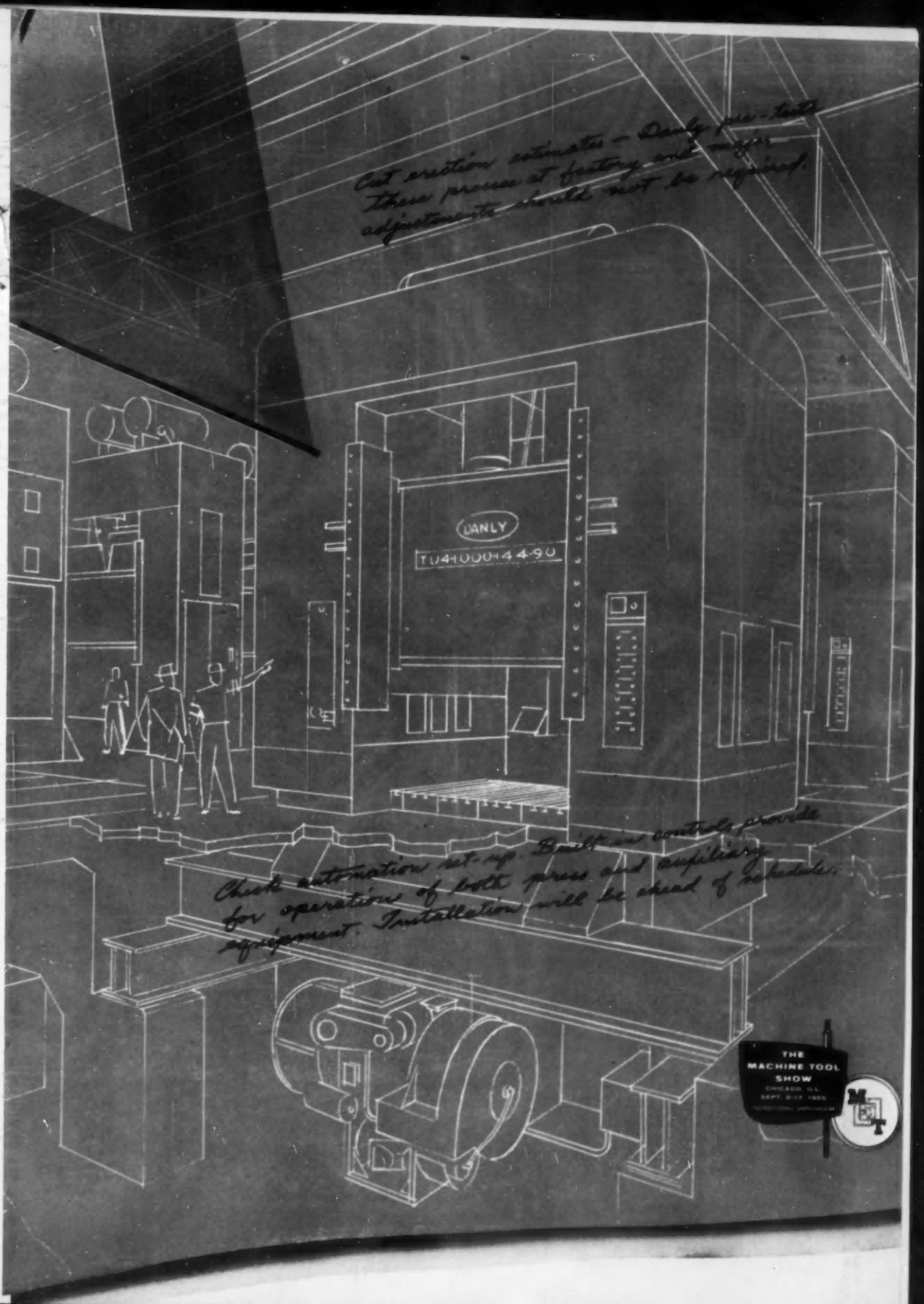
Single Action Straight Side



Autofeed

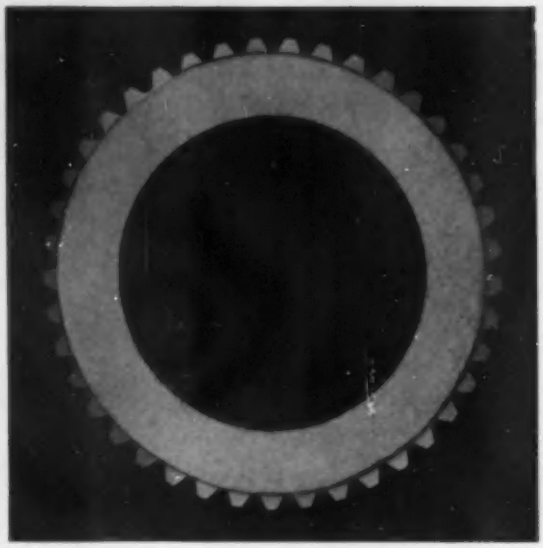
Double Action Straight Side

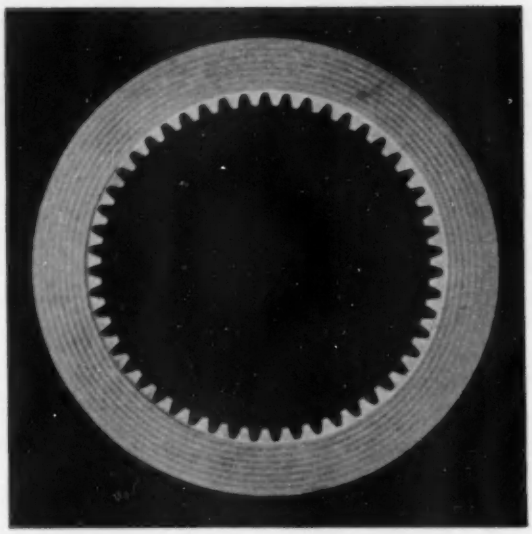
Underdrive



Cut erection estimates – Danly pre-tests these presses at factory and major adjustments should not be required.

Check automation set-up. Built-in controls provide for operation of both press and auxiliary equipment. Installation will be ahead of schedule.





Clutch plates for modern automatic transmissions incorporate semi-metallic facings (above) or non-metallic facings (right), according to manufacturers' specifications.

for the best in

automatic transmissions . . .

moraine friction materials

The range of Moraine friction material formulas is almost limitless. And whether your need is for parts incorporating all-metallic, semi-metallic, or non-metallic friction materials, you can expect more from Moraine . . . because Moraine friction materials meet all the requirements of the application . . . provide superior resistance to heat, wear, and corrosion.

With a long record of performance in Hydra-Matic, Powerglide, and Dynaflow automatic transmissions, Moraine friction materials are finding new uses in heavy-duty truck transmissions, in special military vehicles and equipment, in automotive air conditioning, and in household appliances.

Perhaps Moraine's experience and special abilities with friction materials can be of help to you.

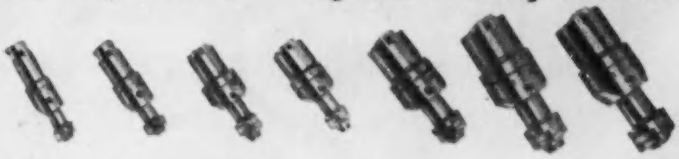
Other Moraine products include: Moraine-400 bearings, toughest automotive engine bearings ever made—M-100 engine bearings and Moraine conventional bi-metal engine bearings—Self-lubricating bearings—Moraine metal powder parts—Moraine porous metal parts—Moraine rolled bronze and bi-metal bushings—Moraine power brakes—Delco hydraulic brake fluids, Delco brake assemblies, master cylinders, wheel cylinders and parts.

moraine products

DIVISION OF GENERAL MOTORS, DAYTON, OHIO

how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" Hydraulics

1 They select the correct size "Hy-Power" Hydraulic Cylinders

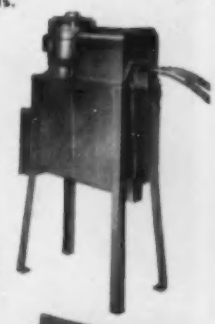


Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

2 They mount the cylinders in Hannifin "C"-Frames

The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

HANNIFIN "HY-POWER" RIVETING IS THE LONG-TIME STANDARD OF THE AUTOMOTIVE INDUSTRY

If you're looking for a better riveting method—whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

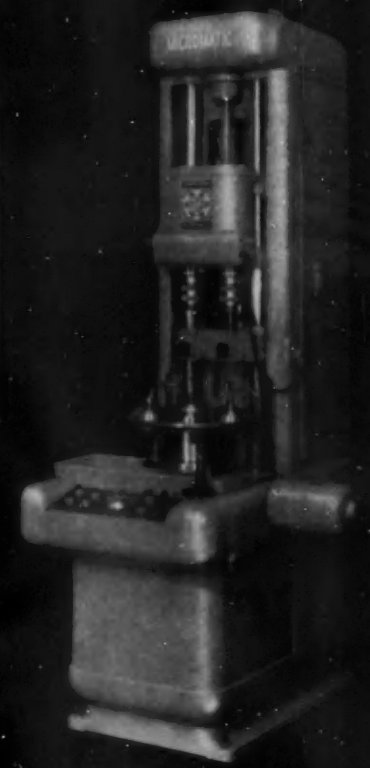
The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in extra operations

INDUSTRY lives with a continuing demand for higher performance and smoother, trouble-free operation of its products. Hence the need for closer tolerances and higher precision of parts, usually achieved through added production line operations and attendant higher costs.

Offsetting this trend toward added operations, Microhoning brings profitable relief. This unique process of controlled abrading can often replace two or more machining operations. Microhoning thus not only removes stock and generates geometric accuracy, but also insures dimensional precision and develops desired functional surface finish—all in one simple, automatic operation.

Why not analyze your processing operations to see how Microhoning—the machining process of multiple benefits—can eliminate some of the extra operations now causing you headaches and boosting your costs? In extra operations you may be paying right now the price of the new Microhoning equipment you don't have.



PART:

Diesel Fuel Injector Body. Long, small diameter bore must be straight and round.

PROBLEM:

To reduce high cost of operations required to generate accuracy.

SOLUTION:

Microhoning—Three operations replace six—size held to .000090 inch, finish 8 to 12 Microinches r.m.s.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

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MICROMATIC HONE CORP. 1538 Grande Vista Avenue Los Angeles 23, California

MICROMATIC HONE LTD. 330 Grand River Avenue Brantford, Ontario, Canada

MICROMATIC HONE CORP. MICRO-MOLD MFG. DIV. 231 So. Pendleton Avenue Pendleton, Indiana

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MICRO-PRECISION DIVISION • 2205 Lee Street, Evanston, Illinois

Hydraulic controls • Diesel fuel injection equipment

Visit Booth 1311 at the Show. See other examples of how Microhoning saves extra operations.

To our Favorite Boss!

From the receptionist at the front door through to the last man on the loading platform—*all* of us here at Great Lakes Steel have a very important *something* in common. It is the knowledge that your continued and expanded need for our products determines the future and growth of every one of us, regardless of our individual jobs here.

It is the knowledge that *you*, Mr. Customer, are the boss!

That's why we at Great Lakes are seeing to it that our steel is the kind you have a right to expect from a specialist in flat-rolled products. We know the importance of prompt shipments, top quality, proper packaging and loading, dependable information, and clerical accuracy. We think you'll agree that our many satisfied customers are a pretty good indication that this policy is good business for all concerned.

Next time you have a problem in steel, call on one of our representatives to help you solve it. You'll be glad you did!

GREAT LAKES STEEL CORPORATION
Ecorse, Detroit 29, Mich. • A Unit of
NATIONAL STEEL CORPORATION

SALES OFFICES IN BOSTON, CHICAGO, CINCINNATI, CLEVELAND, HOUSTON, INDIANAPOLIS, LANSING, LOS ANGELES, NEW YORK, PHILADELPHIA, PITTSBURGH, ROCHESTER, ST. LOUIS, SAN FRANCISCO AND TORONTO

This NEW nylaflow® tubing saves money from beginning to end

NYLAFLOW . . . the new POLYPENCO® nylon* tubing . . . now promises a new kind of performance in pressure lines for lubricants, air, fuel and oil, coolants, process streams, and hydraulic fluids. NYLAFLOW tubing is flexible, resilient and tough. It also resists abrasion and corrosion. Yet, it is economical to use from beginning to end.

FIRST COST OFTEN LESS

Available with a tested bursting strength of 1,000 psi or 2,500 psi, NYLAFLOW tubing costs less in some small sizes than copper tubing. It also costs substantially less than flexible rubber hose of comparable bursting strength.

COSTS LESS TO INSTALL

Flexible NYLAFLOW tubing does away with pre-bending, intermediate fittings, and the need for flexible hose attachments. It can be run in continuous lengths and connected simply by using a standard metal compression or flare fitting at each end. What's more, it's available in colors for color coding.

COSTS LESS IN THE END

Laboratory and field results indicate that NYLAFLOW should outlast other tubing in many applications. For example, NYLAFLOW stands up against constant rubbing, flexing, and vibration. It also absorbs hydraulic hammering and bumping.

SEND FOR NEW NYLAFLOW TUBING BULLETIN

THE POLYMER CORPORATION of Penna. • Reading, Penna.

POLYMER NYLAFLOW TUBING

. . . nylon . . . Teflon† . . . and other non-metallic shapes

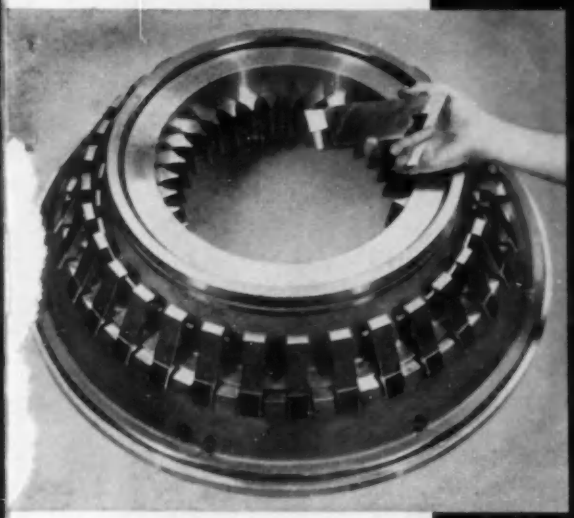
In CANADA. Polypenco, Inc., 2052 St. Catherine W., Montreal, P.Q.

†Teflon is the trademark for DuPont tetrafluoroethylene resin

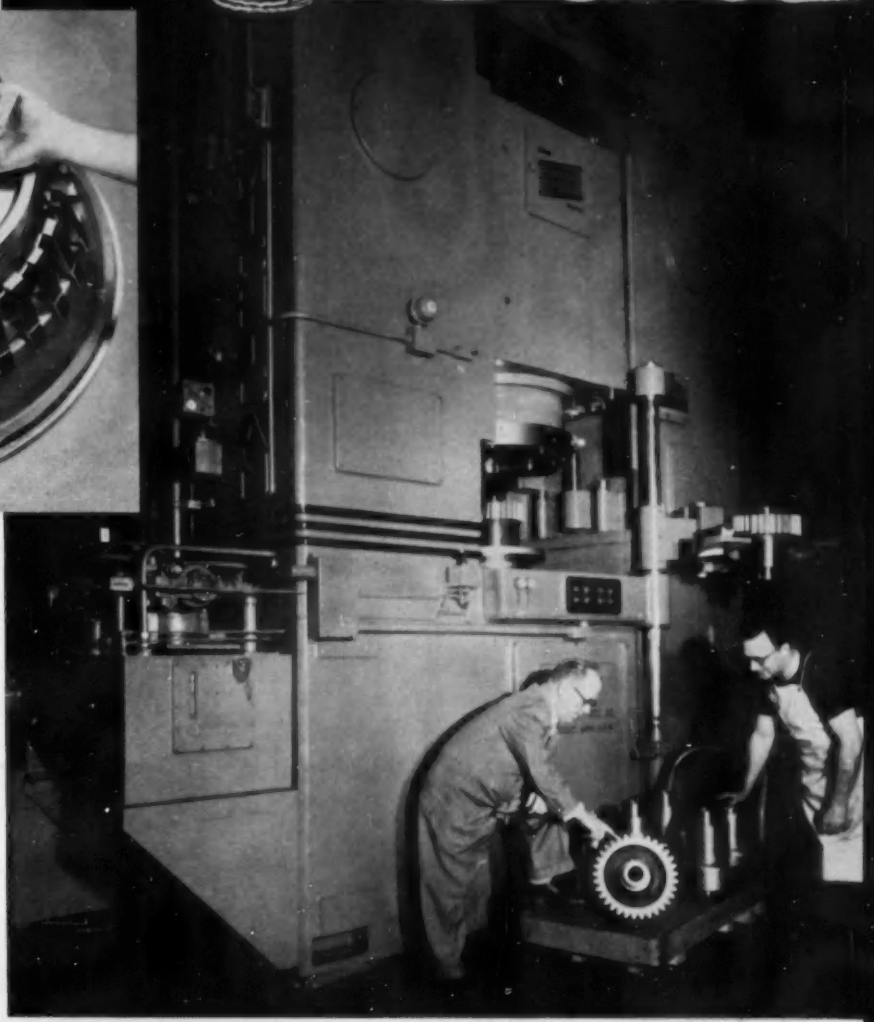
*NYLAFLOW is the trademark for The Polymer Corporation's nylon tubing

This Month's

GEAR PIX



▲ RUGGED ACCURACY is built into this SHEAR-SPEED tool holder used to cut the 33-tooth bull gear in 6½ minutes on the new giant SHEAR-SPEED.



▼ VERSATILITY— Shoulder gear (7.25" dia. x 1" face) being formed on this 18105 SHEAR-SPEED gear shaper at the rate of 23 per hour, is one of 12 different tractor gears regularly produced on this fastest of gear cutting machines.

▲ VERITABLE GIANT is this new SHEAR-SPEED gear shaper. Cutting time on the tractor bull gear shown is 6½ minutes compared to 3 hours by former methods. New bulletin describes the two new SHEAR-SPEEDS with capacities up to 6" face width, 13" and 20" maximum diameters.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

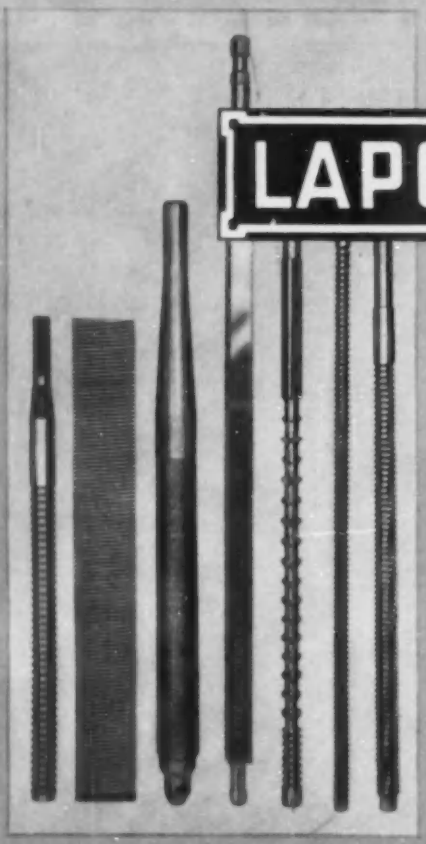
IN CANADA: COLONIAL TOOL CO., LTD.

"A broach is a broach is a broach"

...or is it?

Even Gertrude Stein would never have said that, *if she had taken time to investigate the making of*

LAPOINTE BROACHES



CARBIDE-TOOTH BROACHES are now a real feature . . . made possible by the extremely high range of broaching speeds on modern Lapointe machines.

Into these broaches goes all the engineering skill, the designing and manufacturing "know-how" of 53 years of broach-making. And not only do we produce the conventional types of surface and internal broaches, but we also get the *hard jobs*, the *really difficult ones!* We are the recognized headquarters, for example, for two extremely important types of broaches:

BROACHES for involute gears . . . in the automotive field

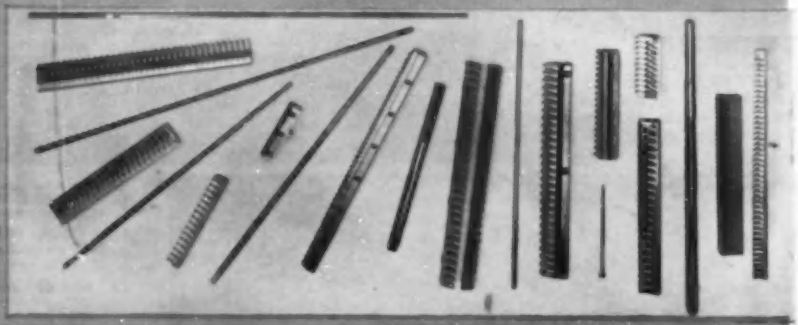
BROACHES for jet engine "pine-tree" forms . . . in the aircraft field

STEEL for all **LAPOINTE BROACHES** is produced under ideal conditions of quality control. Here's what we mean by that:

1. Steel for our broaches is poured to our own proven analysis.
2. Our heats are all poured special.
3. We control the steel all the way — from pouring through heat treating in our atmosphere-controlled electric furnace.

BUYERS OF BROACHES
should consult with us on all their broach problems, for broach grinding is an art — and it has been developed to the highest point of perfection at LAPOINTE.

Electrolized BROACHES,
exclusive with Lapointe, increase life between grinds as much as 2 to 10 times!



THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

ROADRANGER® provides annual fuel savings of $126.36 per tractor

Up to 43% faster trip time and average fuel savings of $126.36 per tractor annually were enough to convince Baltimore Transfer Company. They now specify Fuller R-45 Semi-Automatic ROADRANGER Transmissions for every new tractor purchased.

Baltimore Transfer and its wholly-owned subsidiary—Motor Freight Express—is ordering 48 International R-195 tractors per year, and expects to increase to 96 a year by 1957.

The Fuller Semi-Automatic ROADRANGER was tested by Baltimore Transfer on its own routes, under its own operating conditions, against conventional 5-speed transmissions with 2-speed rear axles. Both transmissions were installed in identical International R-195's, with identical loads.

On a stretch between Baltimore and Blue Mountain, Pa. (22 miles, over hilly terrain) the ROADRANGER-equipped tractor came in 27 minutes ahead of the tractor with the main-and-2-speed axle combination.

Through single-lever control of all forward speeds—and with all ratios evenly and progressively spaced—the Fuller Semi-Automatic ROADRANGER lets the driver select the right ratios at the right time, without having to tussle with gear splits or sit waiting on automatic actuation.

On *your* trucking operations, the result will be more speed on hills, steadier speed in traffic, lower fuel consumption and less engine maintenance. *See your truck dealer, ask him for full details on Fuller Semi-Automatic* ROADRANGER *Transmissions.*

where horsepower *really* goes to work

Fuller TRANSMISSIONS

FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO, MICHIGAN

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

MORE FURNACE VERSATILITY

Lindberg radiant tube is easy to change. Just turn off furnace, lift old tube out and put in new tube.

These are two of the three Lindberg gas-fired radiant tube carburizing and carbonitriding furnaces recently installed by an internationally known maker of farm machinery. With these furnaces 75% of parts are carbonitrided and 25% carburized. In addition, some bright annealing is done and the versatile Lindberg units can easily be converted for other heat treating applications.

Lindberg Vertical Radiant Tube Great Advance in Heat Treating Furnaces

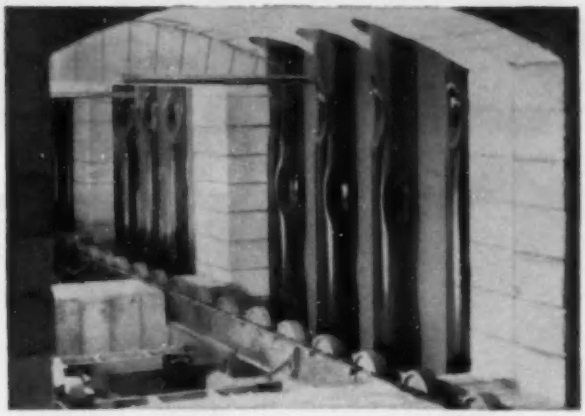
When metal needs heat, Lindberg furnaces with the new Lindberg lightweight vertical radiant tube offer a better way to apply it. Industry the world over is finding that Lindberg furnaces with this new vertical tube provide a versatility no other type of furnace can give. Carbonitriding, carburizing, carbon restoration, bright hardening or annealing and normalizing are all possible with only minor adjustments.

Here are some other exclusive advantages. Lindberg furnaces include a built-in pitless quench tank. Uniform case depth is assured because each charge automatically remains at heat the same length of time. A built-in purge chamber receives work loads for purging prior to heating.

Whatever type of furnace fits your production needs, from gigantic continuous pusher-type to the small manual batch-type furnace, Lindberg engineers can develop exactly the right equipment for you.

This three-row pusher Carburizer, with vertical radiant tubes between each row, was built for a large automobile manufacturer.

WITH LINDBERG RADIANT TUBES



Here you can see the unique "dimpled" design of the new Lindberg vertical radiant tube. Installation is a Lindberg continuous pusher-type gas-fired carbonitriding furnace.

Revolutionary new development

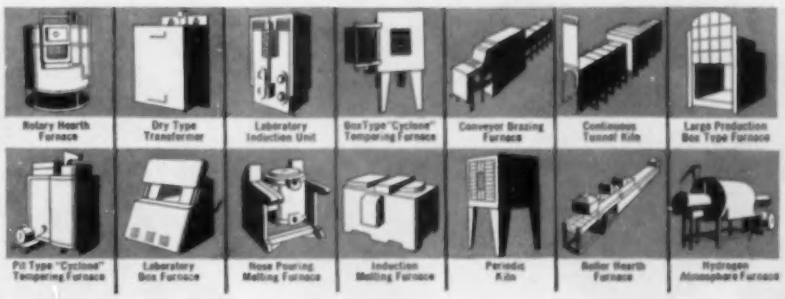
The development by Lindberg of the lightweight, easily-changeable vertical radiant tube (patent pending) is one of the most significant improvements ever made in industrial furnace design. It eliminates the bulk and bend problems of the old-fashioned horizontal tube and the uneven heat patterns inherent in earlier vertical tubes. The secret lies in the new Lindberg tube's "dimples". Here's how they work—in the radiant tube a central stream of mixed air-and-gas is surrounded by a cylindrical stream of air alone and combustion occurs in the area between these two streams. The "dimples" create eddies in the streams accelerating combustion and maintaining even temperatures along the entire length of the tube. If you aren't fully familiar with this revolutionary development ask us, or your nearest Lindberg Field Engineer about it.

This newly-designed Lindberg Hyen generator is used with Lindberg radiant tube furnaces to supply the most exacting atmospheres needed for any heat treatment.

Here is the new Lindberg Carbotrol unit which automatically controls the carbon potential of furnace atmospheres provided by the Lindberg Hyen generator.

For the final step in heat treating, the famous Lindberg cyclone tempering furnace, for 20 years the standard of furnace performance. Pit or box type available.

Lindberg manufactures many kinds of equipment in the industrial heating and related fields. A few of these are symbolized here. If you are interested in any of these please write us for the specifics on them, or get in touch with your nearest Lindberg Field Engineer. (See your classified telephone book.)



LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California • **Associate Companies:** Lindberg Industrial Corporation, Chicago • EFCO-Lindberg, Ltd., Montreal, Canada • Lindberg Italiana, Milan, Italy • The Electric Furnace Company, Ltd., Weybridge, Surrey, England • Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany

This is a fast

Every hour, this Newton Vertical Rotary roughs and finish mills the tops of 600 aluminum pistons at 85% efficiency.

The machine automatically clamps, unclamps and ejects the finished pistons onto a conveyor. All the operator does is load!

A Newton Vertical Rotary is more than a machine tool—it is a method—the fastest known method of milling the flat surfaces of repetitive pieces!

CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL

one!

For aluminum milling, Newton Vertical Rotaries have high speed Vee belt drives and feeds up to 100 inches per minute.

COMPANY, ROCHESTER 10, N. Y.

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BIRMINGHAM CO., INC.

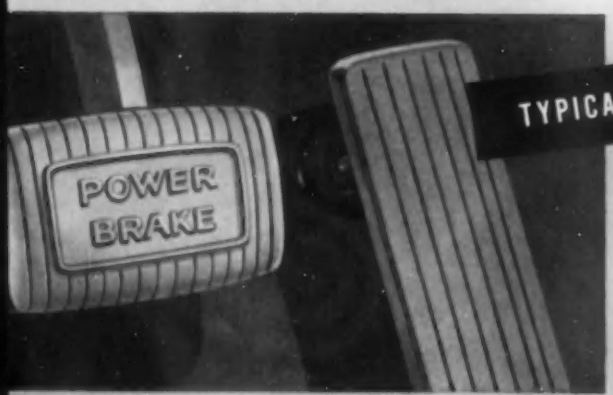
Bendix Products Division

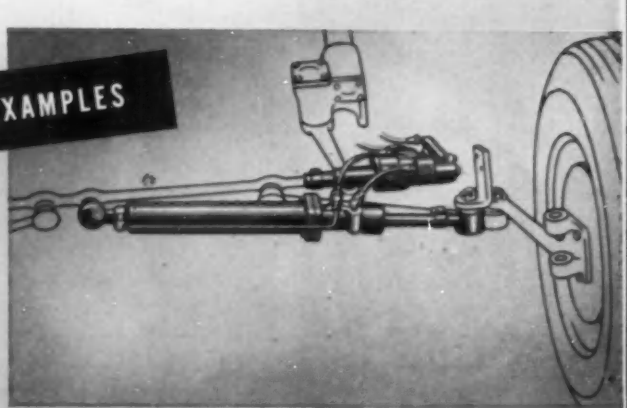
A good reliable source

FOR AUTOMOTIVE COMPONENTS

Over two million square feet of floor space at the Bendix Products Division insures the manufacturing capacity to meet volume requirements, with on-schedule deliveries in a wide range of automotive components.

TYPICAL EXAMPLES





BENDIX LOW PEDAL POWER BRAKE—Specified by more car manufacturers than any other make, Bendix* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!

BENDIX LINKAGE TYPE POWER STEERING—Because Bendix* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

*REG. U. S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

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High Spots of This Issue

★ Analysis of the Results of Indianapolis "500"

Unfolded before the reader's eyes here are all the drama and danger of the Memorial Day speed classic from the tragic crash of Bill Vukovich to the triumph of Bob Sweikert. Many of the outstanding cars and events are illustrated. Page 52.

★ Mass Production Methods at Station Wagon Body Plant

Said to be the largest producer of finished and trimmed station wagon bodies, Ionia Mfg. Co. expects to turn out over 30,000 units for 1955 models. Presented in this article is a survey of the company's facilities and operations. Page 58.

★ Advances in Hydraulics Analyzed at Conference

Vickers, Inc., continuing its educational services to industry, sponsored the First Fabricating Machinery Hydraulics Conference in Detroit last month. Approximately 140 guests heard and talked much about hydraulic system uses. Page 61.

★ Rapid Growth of Off-the-Highway Vehicle Industry

In this second section of a two-part article, the author describes off-the-highway vehicles used for operational purposes, as opposed to pure construction machinery. Their many applications in numerous fields are explained. See Page 62.

★ Ausco Method for Casting Packard V-8 Crankshafts

Auto Specialties Mfg. Co. has long been a specialist in the production of cast crankshafts for automotive vehicles. Discussed in this particular article are the techniques used for making such units for Packard. Page 68.

★ 44 New Product Items And Other High Spots, Such As:

Fokker planes to be built in U. S. and Brazil; Chrysler adopts plastics for parts, dies, and fixtures; design features of Lancia V-8 competition car; two-stroke Diesel has no crankshaft; automated magnetic particles; exhaust silencers; balancing engine parts; three-year Ford pact is new step; and Materials Handling Exposition developments.

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AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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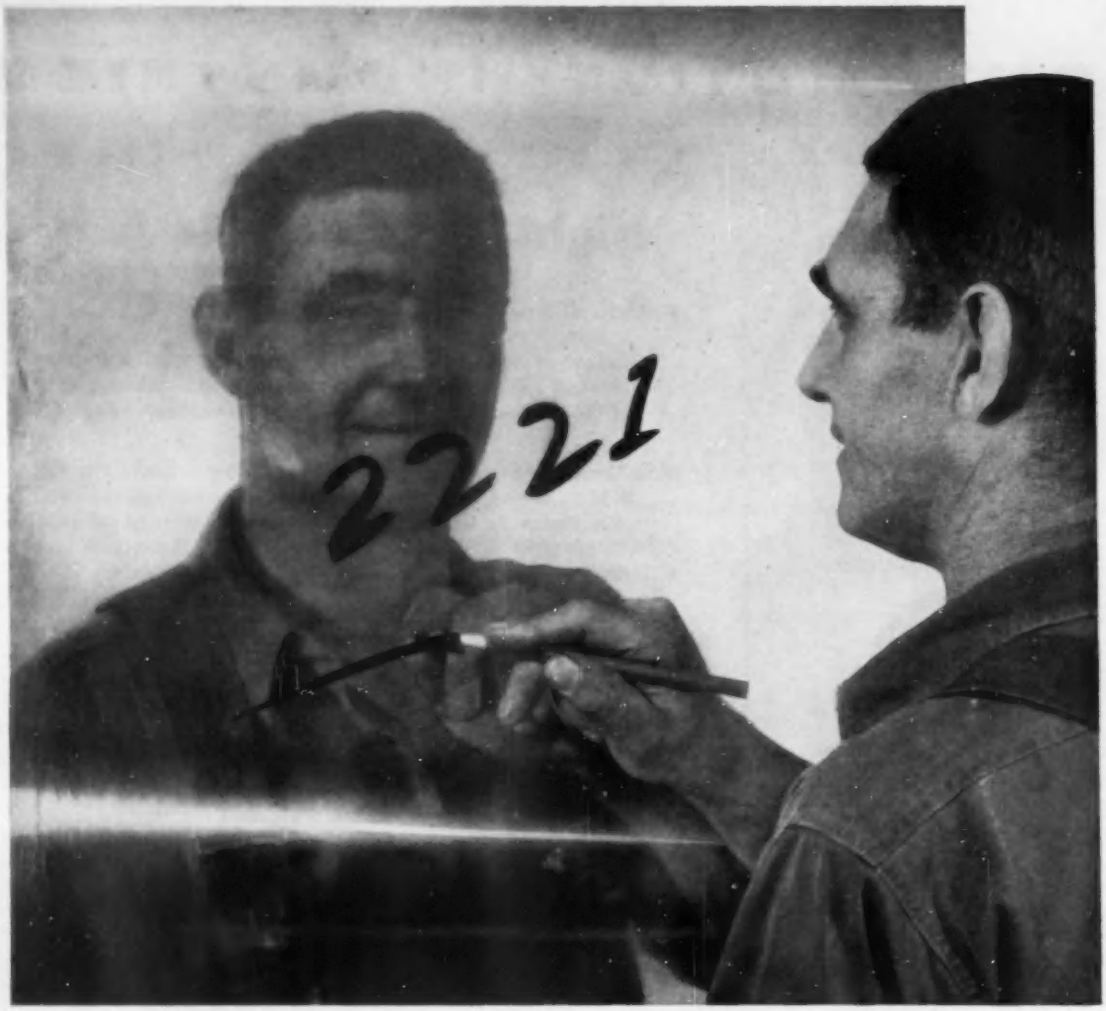

The stainless you need is here

2221 sizes, shapes, finishes and types actually in stock

Here, in the world's largest stainless stocks, the exact steel you need is ready for immediate shipment—in any quantity. That's because Ryerson carries more tonnage in more types, shapes and sizes than any other source. Many requirements are available only at Ryerson. And, all Ryerson stainless is time-tested Allegheny Metal, the quality stainless you can depend upon.

Here experienced steelmen who know your industry's requirements are ready to work with you. And unexcelled specialized facilities are at your disposal for sawing, shearing, flame-cutting or otherwise preparing stainless to your exact specification.

So for every stainless requirement—and for every kind of carbon and alloy steel as well—call Ryerson for quick, dependable service.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 112, No. 12 June 15, 1955

Ford Starts Enlarging Transmission Facility

First phase of Ford Motor Co.'s new $625 million expansion program, annnounced several weeks ago, will include expansion of facilities for automatic transmission production. A 580,000 sq ft unit will be added to the Livonia, Mich., automatic transmission plant.

The present structure in Livonia occupies about 1.5 million sq ft of space. It has been turning out automatic units for Lincoln and Mercury cars and transmission parts for Ford in Cincinnati, O.

Production in the new annex is expected to start in mid-1956. The expansion is part of a three-year program which may give Ford at least two new major plants—one for the Lincoln Div. and another for a new model which has been temporarily designated the "E" car.

Record Car Output for Year Seen Despite Coming Decline

Automobile production, although dropping a bit last month (May), already has reached a six-month record. If the scheduled 730,000-plus cars are built this month, total first-half output may top the four million mark.

At the end of May, output totaled 3.6 million cars, slightly more than during the last six months of 1950, the previous record half-period. Total output for the first five months was more than 45 per cent higher than in the same period last year.

Based on forecasts of annual production by the industry, output is almost certain to taper off in the second half. Some industry sources predict that production in the last half of this year may drop by as much as one-third under the first six months. However, the industry may still turn out approximately seven million cars for 1955 to surpass the record year of 1950, when 6.6 million units were produced.

Prospects are for somewhat reduced, but still strong, sales during the coming months. Sales last month continued at a peak pace with a number of car makers again setting records. Mercury, Buick, Oldsmobile, and Nash were among those reporting continued high sales during the first part of May.

MAMMOTH MOBILE CRANE TRANSPORTS BOMBERS

The Navy's new MB-1 mobile crane, able to pick up a four-engine bomber and walk away with it, will be assigned to lifting of planes for checking of hydraulic landing gear systems and to other utility purposes. The 48-ton giant is able to travel at speeds up to 40 mph and can raise a weight of 80,000 lb. Designed and built by Le Tourneau-Westinghouse Co., it has a 325-hp Buda engine and, with boom in an upright position, measures more than 35 ft high, over 50 ft long, and more than 13 ft wide.

GM Planning Cut in Number Of Motorama "Idea" Cars

General Motors Corp. is said to be backing off a little on the number of "idea" cars it will have in the future. Hereafter, each division reportedly will be limited to one "dream" car for each year's Motorama series.

The corporation also will have only one idea car, according to reports. In the past, both the corporation and some divisions have had as many as three such cars for each year's Motorama.

Packard Off to Good Start Toward 1955 Output Figure

Barring any difficulties, Packard may achieve its objective to produce 100,000 cars this year, if it continues at the present rate of production. Up to last month, the division had turned out more than 35,000 cars, 16 per cent more than the entire 1954 model run.

Luxury Packard models are accounting for more than 45 per cent of the company's total output. This figure compares with about 26 per cent last year.

Chrysler Builds Millionth Automatic Transmission

A two-day ceremony at the Chrysler plant in Indianapolis, Ind., last month observed production of the corporation's one millionth PowerFlite transmission. The special gold-plated unit was presented to W. C. Newberg, president of Dodge, on behalf of employes at the Indianapolis plant.

News of the AUTOMOTIVE

FOUR-WHEEL DRIVE ITALIAN CARGO CARRIER

The OM Co. of Italy produces the 20 NT truck with four driving wheels for the transportation of cargo over rough terrain. The two-ton unit has: a four-cylinder direct-injection Diesel engine with an output of 54 bhp at 2100 rpm, ten-speed gearbox, and a wheelbase of eight ft, 1½ in.

Plymouth Station Wagons Get Plastic Headlining

Plymouth is the first car manufacturer to offer a plastic headlining. Made of rubber resin alloy, the single-piece headlining now is being installed on all Plymouth station wagons at no price differential to buyers.

Among the advantages claimed for the plastic headlining are that it is easy to clean, allows more head room, and provides better insulation. It can be removed to permit access to electrical wiring and comes in five colors.

Progress Made in Overhauling Of Army Supply System Cited

The Army has overcome many problems in its procurement system and is now on the threshold of a "revolutionary improvement" in the supply of repair parts, according to Gen. Williston B. Palmer, vice-chief of staff. Speaking in Detroit recently, Gen. Williston pointed out that, during the past three years, the Government's inventory of parts has been reduced from $6 billion to $3 billion, and the number of items cut from 900,000 to 600,000.

Gen. Williston said the Government has been able to reduce the number of warehouses, in which 80 per cent of the Army's inventory is stored, from 73 to 54 in one year. By closing out marginal depots and retaining a modern, well-located system, the Army has saved $30 million in operating costs annually.

Last January, the Army's warehouse inventory was valued at more than $20 billion. This figure included about $4 billion worth of goods in depots outside the U. S.

Basically, savings in the overall warehouse system were accomplished by a five-point program which included: restriction on new procurement and disposal of wornout, obsolescent stock; direct delivery from industry to the Government's retail outlets instead of to warehouses; reduction in the number of different items from 1.5 million to one million; stronger inventory management; and standardization.

Denison Engineering Bought By American Brake Shoe Co.

Denison Engineering Co., Columbus, O., has been acquired by American Brake Shoe Co. The company, a producer of hydraulic presses, pumps, and automatic controls, will be operated as a wholly-owned subsidiary of American Brake.

Chrysler Links Press Plant With Automotive Body Div.

Closer coordination between fabrication and assembly of automobile body posts is expected to result from integration of Chrysler Corp.'s Nine Mile Press plant, located north of Detroit, with the Automotive Body Div.

It is the fourth plant which has been divorced from Dodge Div. in the past several weeks and is the twelfth to be combined under the Body Div. Earlier, three component producers in Indiana, operated by the Dodge Div., were placed under the newly formed Supply Div. of Chrysler Corp.

The Nine Mile plant contains 1.2 million sq ft of floor space. It supplies body stampings and assemblies to all Chrysler Corp. vehicle divisions.

Renault Absorbs Latil, Somua; New Transmission Is Underway

Renault, said to be the largest automobile company in France, has absorbed the Latil and Somua organizations to form one company for the production of buses, coaches, and trucks of more than five-ton capacity. Renault will continue to make passenger cars and light commercial vehicles.

The new company also intends to undertake full production of the Renault R 100 automatic transmission. This unit comprises a torque converter and a two-stage epicyclic gear with a manual control for reverse.

For the last 50 years, Latil has specialized on heavy trucks and special tractors. While producing heavy trucks and buses, Somua has important shops for machine tools, printing, and other types of machinery.

The three concerns have truck-producing facilities totaling 2.75 million sq ft. Last year, output was 2140 units for Renault, 1036 for Latil, and 489 for Somua.

The amalgamation will not, however, make Renault the leader of French truck production. Berliet heads the list in heavy vehicles with an output of 6220 units last year, and Chausson remains the largest coach producer in France.

AND AVIATION INDUSTRIES

AMC Continues to Put Faith in Rambler Car

American Motors Corp. continues to count heavily on the Rambler to boost its sales and share of the automobile market this year. The foregoing is obvious from the fact that the big share of AMC's recently announced $60 million modernization program is going for expanded Rambler production.

Total capacity for the car will be increased from 500 units a day to 800, or more than 50 per cent. Facilities for output of Nash and Hudson cars will also increase about 30 per cent.

New facilities for the Rambler in Kenosha, Wis., are scheduled for construction in August. These will include a separate final assembly line, new sub-assembly and feeder lines, inspection, and testing facilities. Conveyor systems at the Rambler body plant also will be extended, and additional welding and painting equipment installed. When the modernization program is complete, total capacity for all AMC cars produced in Kenosha eventually will be boosted from the present 1200 units a day to 1700.

Twin Coach Acquires Rights To Aerojet Marine Engines

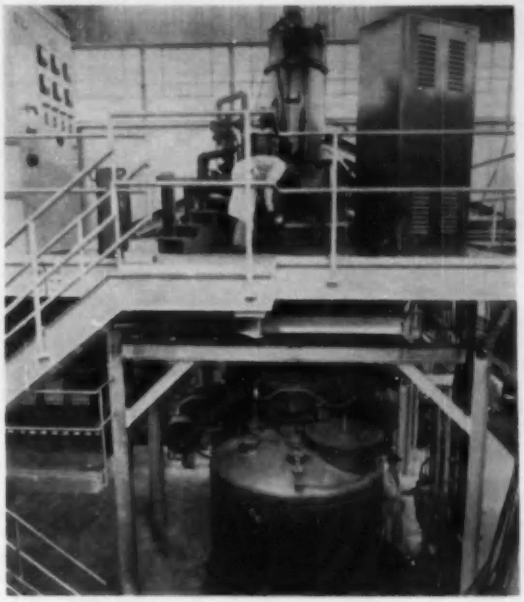
Manufacturing and sales rights to marine engines produced by Aerojet-General Corp., subsidiary of General Tire & Rubber Co., have been acquired by Twin Coach Co., Kent, O. All equipment and inventory for the engine will be moved to the Fageol Products Co. plant, engine-building subsidiary of Twin Coach.

Louder Horns for Vehicles Under Study By Engineers

The rear-mounted microphone on the Lincoln Futura may prove to be more than an interesting novelty. Automotive engineers are working on making horns more audible or devising some other type of signal for warning other drivers. One company is said to be testing a device which automatically flashes the headlights when the horn ring is depressed.

VACUUM FURNACE

Carboloy Dept. of GE, Detroit, has installed a 1000-lb semi-continuous vacuum melting furnace. Designers will have more leeway in selection of critical materials such as alloys using titanium and zirconium, nickel and cobalt, and low-alloy high-strength steels. Built by Consolidated Vacuum Corp., the modular-type furnace has interchangeable bottom to make single ingots, multiple-shaped castings or centrifugal castings. The crucible can be charged, alloying elements altered and ingots removed without breaking main vacuum.



One Car Producer Studying Tubular Bumpers for 1957

One automobile company is said to be considering the use of tubular bumpers for its 1957 models. They would be of alloy steel and consist of an upper and lower horizontal bar joined at the ends with a half circle. Reported advantages would be a greater vertical protective area, saving in weight, and lower fabricating costs.

Torsion Bars Spur Research On New Suspension Systems

There appears to be a great deal of interest in some type of levelizing device for automobiles which will do a job similar to that done by Packard's current torsional suspension. One consideration is the general overall lower heights (possibly down to 57 in.) expected to come in the next two or three years.

Engineers also are interested in maintaining a constant "design" height, which would keep the car in a constant plane, despite passenger load or distribution, for appearance reasons. Reports indicate current suspensions could be levelized, but that they would cost more than if they were parts of torsion bar systems.

Factory Vehicle Sales Hit Four-Month Height

High automobile production in March and April resulted in record factory sales of 3,246,758 motor vehicles for the first four months of this year, according to official figures of the Automobile Manufacturers Association. The total consisted of 2,857,932 cars and 388,826 trucks and buses.

In the comparable period of 1954, factory vehicle sales totaled 2,350,-051 units. The number of vehicles exported totaled 166,954 to account for about 5.1 per cent of total sales.

Fruehauf Sets Up Ohio Branch Plant

A 35,000 sq ft branch plant has been opened in Columbus, O., by Fruehauf Trailer Co. to serve the central Ohio area. In addition to sales, distribution, and service operations, the new unit is equipped to manufacture custom trailers on a small scale.

News of the AUTOMOTIVE

INTER-CITY WHIRLYBIRD

Shown here is a model of the new British Fairey Rotodyne helicopter. It combines the principles of forward propulsion by propellers linked with two Napier Eland 2800-hp turboprop engines (see A.I. Jan. 15, page 104) and vertical lift by a four-bladed rotor powered by jet units at the tips. It has a capacity of 3300 cu ft and is able to carry 50 persons altogether.

V-8 Engines Now Offered On Most Chevrolet Trucks

The trend toward the use of V-8 engines in trucks continues. Chevrolet now is offering the powerplants as options on all truck models except cab-forward units. In addition, the Taskmaster V-8, previously offered only in low cab-forward models, now will be available also in heavy-duty two-ton conventional trucks.

A second V-8 engine also has been added to the line. Called the Trademaster, it produces 145 hp and is designed for light and medium-duty trucks.

Vacation Payments Total $18 Million at Chrysler

Chrysler Corp. reports it will pay its hourly employes about $18 million this year in lieu of vacations. Employes must have at least one year service with the corporation to be eligible for the vacation pay, which is being distributed to more than 115,000 workers.

North American Develops Powerful Rocket Engines

Rocket power plants of relatively small size, reportedly capable of developing more jet horsepower for a short period than the total power output of Hoover Dam, are said to have been developed by North American Aviation, Inc. Thrust of the units remains top secret, however.

The company is also working on an entry in the race to produce practical atomic power for commercial use—a sodium graphite reactor power plant. North American hopes to have its unit in full operation in early 1956. It then plans to go into the business of engineering and constructing reactors for such power plants, according to reports.

Houdaille-Hershey Names New Slate of Officers

Acquisition of Frontier Industries, Inc., by Houdaille-Hershey Corp., has resulted in several changes in top level management at the latter company. Houdaille acquired Frontier through the exchange of 1½ shares of Houdaille common stock for each of the 265,000 shares of Frontier common now outstanding.

Gerald C. Saltarelli, former general manager of Houdaille's Detroit Automotive Div., is now vice-president in charge of operations. Other officers of Houdaille elected include: George F. Phillips, vice-president; Oscar F. Schettler, secretary; and Robert L. Wilson, treasurer.

Appointed officers include: F. A. Smith, vice-president and head of the Automotive Div.; Herbert H. Roosa, vice-president of Houdaille subsidiaries; Charles Wright, III, and William E. Speer, assistant secretaries; and A. Elmer Lowry and Thomas S. Bainbridge, assistant treasurers. Charles Getler is chairman and V. P. Burgess is comptroller.

Separate Styling Studios Are Established by Ford

Individual styling studios have been established by Ford Motor Co. for each of its cars to mark another major move in the company's continuing reorganizational program set in motion several months ago. Similar to GM's setup, separate studios will provide individual attention to each line of vehicles, and a chief stylist will head each unit.

Chief stylists named for each of the studios, which will be located within the Ford Styling Office in Dearborn, Mich., are: Robert H. Maguire, Ford cars and trucks; Eugene Bordinat, Mercury; John Najjar, Lincoln; Roy A. Brown, Jr., Special Products; and Alex S. Tremulis, Staff Advanced and Special Styling.

Only Two Makers Planning Body Changes on '56 Cars

Nearly all 1956 model cars are expected to feature extensive styling revisions, but only two will have completely new bodies, according to latest reports. Changes on most will consist of sizeable modifications in front and rear fenders, grilles, trim, and perhaps deck lids.

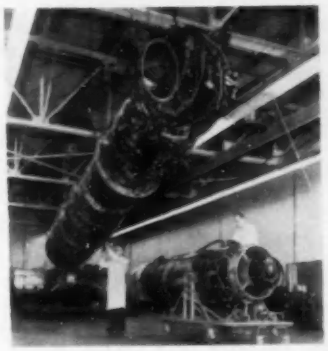
Next complete body changes, except for Lincoln and Nash Rambler (considered due in 1956) are expected on 1957 models. GM reportedly will have new bodies in all lines for 1957, thus abandoning its previous policy of changing Buick, Oldsmobile and Cadillac one year, and Pontiac and Chevrolet the following year.

Output of Convertibles Rises During First Half

Although convertibles represent only a fraction of the total automobile market, several car companies report that sales of the 1955 models are up substantially. Chevrolet, while not citing any figures, said that its output of convertibles up to the end of May was higher than the total run for 1954 models.

Ford and Plymouth also reported slight increases for the first six months. It has been estimated that industry-wide production of convertibles represents only slightly over one per cent of total car output.

AND AVIATION INDUSTRIES



ALLISON POWERHOUSE

The bifurcated air inlet duct identifies the Allison J71-A-2 turbojet engine for installation in the McDonnell F3H-2N Demon fighter. In the 10,000-lb thrust class, the J71 exceeds the unaugmented thrust of the J35 (lower right) by approximately 44 per cent. This does not include the additional thrust provided by the high altitude combat afterburner on the J71-A-2 jet engine

45-Acre 'Research Village" Is Planned By Borg-Warner

A one-story laboratory building is being planned by Borg-Warner Corp. as part of a "research village" to be located near Des Plaines, Ill. To be located on a 45-acre site, the 33,750 sq ft structure may eventually employ 400 persons. The facility would be used for the development of products for all B-W divisions and absorb present research operations in Bellwood, Ill.

European Cars and Trucks Shown at Canadian Fair

European cars and trucks were featured at the Canadian International Trade Fair in Toronto from May 30 to June 4. Mercedes-Benz, Skoda, and Renault cars were on display, while Czech aircraft were also shown for the first time in North America at the exposition.

Renault rear-engine small passenger cars from France, and larger Skoda automobiles from Czechoslovakia were displayed. Motokov also had a twin-engine, four-place light airplane, a dual-controlled elementary trainer plane, and a glider at the show.

AI TABLOID

Carborundum Co. has established a new operating unit known as Ceramic Fiber Project. It will manufacture high-temperature fibers finer than human hair.

* * *

Oakite Products, Inc., has formed an Export Div. to handle increasing demand for its products from Latin America and other countries.

* * *

Ryan Aeronautical Co. has received a $1 million contract from Wright Aeronautical Div. of Curtiss-Wright Corp. for production of a new afterburner. It will be used on a new Wright jet engine.

* * *

Westinghouse Electric Corp. states that sale and use of its new Safe-T-Beam headlamp has been approved by all 48 states.

* * *

Hall-Scott Motors Co. has bought Bardwell & McAlister, Burbank, Calif., electronics manufacturer . . . Dumont Aviation Associates has purchased Industrial Associates, Inc. . . . Erickson Tool Co. has bought E. Westberg Corp.

* * *

Aluminum Co. of America is said to have developed a new aluminum alloy that can withstand high-friction heat at supersonic speeds.

* * *

Strick Co. has announced a truck-trailer with a two-way roof that slides off either end of the trailer.

* * *

Parrish Pressed Steel Div. of Dana Corp. will hold its 50th anniversary festivities at Reading, Pa., on June 19. . . . Irvington Varnish and Insulator Co. is celebrating its Golden Anniversary this year.

* * *

Fruehauf Trailer Co. expects to be producing its new Volume Van trailer at a rate of 2000 units a month by August. The company is also experimenting with multi-hued trailers.

Rolle Manufacturing Co. is using the Al-Fin Fer-Mag process in the fabrication of jet engine components for Westinghouse Electric Corp.

* * *

Ford Motor Co., Ltd. of England reportedly will spend $180 million for expansion in the next five years. . . . Topp Industries, Inc., will spend $700,000 for expansion of facilities for the manufacture of aircraft electronic devices.

* * *

Aluminum Co. of America will install a 160-in. hot sheet rolling mill at its Davenport, Ia., works.

* * *

Fairchild Aircraft Div. has established a Military Relations Dept. . . . AirResearch Aviation Div. has formed a Speed-Range Dept. to specialize in contouring aircraft wings.

* * *

Fruehauf Trailer Co. is expected to build new facilities in Seattle, Wash., San Francisco, and Los Angeles, Calif., this year.

* * *

Marmon-Herrington Co., Inc., has completed arrangements to purchase most of the common stock of Cardox Corp. . . . Lyon, Inc., has agreement to buy a substantial portion of the common stock of Canadian Motor Lamp Co., Ltd.

* * *

B. F. Goodrich Co. has announced its association with Peruvian interests to establish a tire and rubber company in that country.

* * *

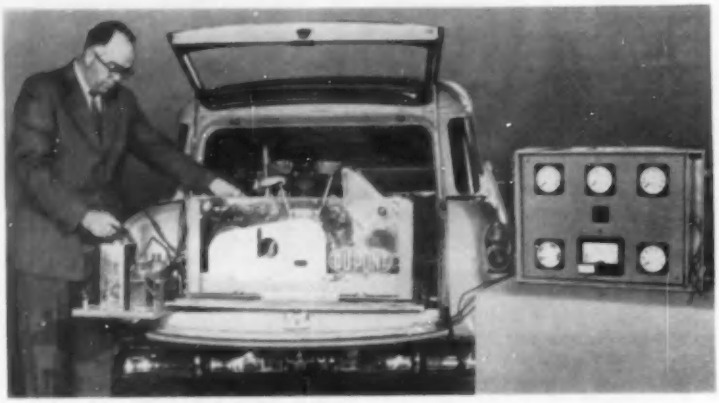
Teer, Wickwire & Co., Jackson, Mich., has purchased the Air and Hydraulic Cylinder Div. from Lindberg Engineering Co., Chicago.

* * *

Fawick Corp. has been licensed to make and sell Girling brakes and brake components in the U. S.

(Turn to page 106, please)

News of the AUTOMOTIVE



DuPont's adaptable new single cylinder engine demonstration. Compression ratio of the engine is 9 to 1, and it can be readily removed from station wagon position.

Fuel Qualities Demonstrated By Portable Engine Setup

A new single cylinder engine demonstration unit which is portable and easily set up has been designed by the Petroleum Chemicals Division of E. I. du Pont de Nemours & Co. to help gasoline marketers show the qualities of their fuels. The engine with its overhead valves and modern design combustion chamber can demonstrate almost any performance quality of a gasoline.

The unit shown here can be used indoors as well as in the back of a station wagon. The dials on the instrument panel to the right show the performance characteristics of the engine as the fuel is being tested and is for demonstrations before small groups. For larger groups, the readings on the instrument panel dials are projected on a screen.

This engine also can show how gasolines are tailor-made by selecting fuel stocks to impart certain desirable characteristics to finished gasoline, such as rapid warm-up qualities and resistance to detonation and preignition. The unit also will demonstrate the wide variety of factors which influence knock—such as temperature, humidity, barometric pressure, carburetor setting, spark timing, as well as spark plug fouling and its effects on performance.

The single cylinder engine demonstration units soon will be available at regional offices of du Pont's Petroleum Chemicals Division at Los Angeles, Chicago, Tulsa, Houston, and New York.

FIVE-MONTH CHRYSLER, AMC OUTPUT DOUBLES 1954

1955 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	May 1955	April 1955	May 1954	Five Months 1955	Five Months 1954
Hudson	3,595	6,989	2,469	29,963	10,637
Nash	14,659	14,515	4,561	59,293	30,966
Total—American Motors	18,244	21,514	7,030	89,256	41,603
Chrysler	17,573	17,760	8,185	93,386	49,185
De Soto	11,845	14,240	5,387	69,374	32,859
Dodge	23,393	30,472	11,366	153,262	56,065
Plymouth	68,143	70,443	33,087	356,380	172,693
Total—Chrysler Motors	120,954	138,915	58,637	672,402	310,802
Ford	153,294	153,940	125,890	745,842	623,508
Lincoln	3,886	4,548	2,966	19,528	19,216
Mercury	42,627	43,354	22,336	192,991	130,304
Total—Ford Motors	199,807	201,842	151,000	958,361	773,028
Buick	76,925	79,181	51,183	381,684	237,794
Cadillac	13,497	14,126	11,250	70,639	49,461
Chevrolet	164,053	163,179	130,956	806,270	630,313
Oldsmobile	57,860	58,825	43,045	273,954	179,793
Pontiac	54,629	58,604	31,925	287,729	166,116
Total—General Motors	366,964	370,918	268,359	1,702,276	1,263,477
Packard	8,139	7,867	1,557	35,667	18,542
Studebaker	9,982	11,725	4,691	64,572	36,404
Total—S-P Corp	18,121	19,592	6,248	100,239	52,946
Kaiser	408	None	1,425	408	4,475
Willys		1,314	1,561	5,694	6,997
Total—Willys Motors	408	1,314	2,970	6,102	11,472
Total—All Makes	724,505	754,096	484,250	3,606,639	2,453,328

Out-State Car Buyers Exempt From Michigan Sales Impost

Out-state residents buying a car in Michigan are now exempt from paying the three per cent sales tax. Thus, further savings, in addition to freight charges may be realized. A motorist buying a $2,000 car, for example, will save an extra $60. Under a new law passed in Michigan, the out-state buyer needs only to pay a $5 fee in lieu of the tax.

Earlier Debuts Are Due For 1956 Automobiles

The 1956 automobiles are expected to be out a little earlier than the time when 1955 models appeared last year. In general, announcement dates appear to be set for one to two weeks ahead of last year's to indicate early November for some.

Chrysler reportedly has set a July 1 deadline for dealers to order 1955 models and expects to wind up production late in that month. The first new model of the 1956 season probably will be Lincoln and may come out in September.

AND AVIATION INDUSTRIES

Millionth '55 Ford Car Displayed in Dearborn

Ford Div. last month (May) marked another milestone with production of its millionth 1955 car. Built at the Kansas City plant, the car will go on display at the Ford Rotunda in Dearborn instead of being shipped to a dealer.

The millionth 1955 car was turned out in 6½ months. This was about 1½ months earlier than the millionth 1954 unit, thus indicating the rapid production pace on this year's models.

1.35 Million Vehicles GM's Goal for Quarter

Backed by record production in April, with the fast pace continuing into May, General Motors Corp. is scheduling output of 1.35 million cars and trucks for the second quarter. According to latest reports, all GM divisions again topped previous sales records.

Peak sales during the first 20 days of May brought total GM new car sales for 1955 through May 20 to 1,477,375 units. From the beginning of January to May 11, GM estimated its new car sales were 43 per cent above the same period a year ago.

Trailmobile Buys Plant And Property in Texas

The 170,000 sq ft plant in Longview, Tex., formerly operated by Powers Mfg. Co., has been purchased by Trailmobile, Inc., from the Reconstruction Finance Corp. While price for the plant and the 70-acre site was not disclosed, the company estimates it will have spent $1.5 million when it completes installing equipment.

Supplement Contract Given AC to Modify Skysweeper

AC Spark Plug Div. has received a contract to modify the electronic control systems on Skysweeper artillery machine guns now in service. The contract, valued at $2.83 million, calls for delivery of "modification kits" next September. The improvements are already built into present units which AC is producing for the Army.

(*Turn to page* 106, *please*)

CONVERTIPLANE MAKES SUCCESSFUL FLIGHT

Successful conversion from helicopter to conventional airplane flight was achieved recently by the McDonnell XV-1 Convertiplane. Overhead rotor of the experimental plane is driven by pressure jet engines located at the tip of each of the three blades. The pusher propeller is powered by a Continental R-975-19 reciprocating engine. The latter also is used to drive compressors which supply air to the jets.

PLASTIC CAMEO

Spread on the ground are the reinforced glass fiber parts used by Chevrolet to produce its Cameo Carrier retail delivery truck. At the right and left are the support-fillers (top) and the side panels. In the foreground can be seen the end gate panel and spare tire compartment being held by a mechanic.

TRUCKS OUT AHEAD OF 1954 FOR FIRST TIME THIS YEAR

1955 U. S. Motor Vehicle Factory Sales*

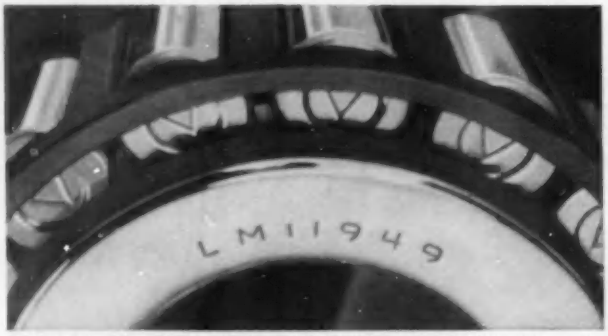
	Passenger Cars	Trucks	Buses	Totals 1955	Totals 1954
January	635,513	89,676	190	725,379	561,134
February	677,705	67,081	176	744,942	534,146
March	791,280	102,992	325	894,597	633,003
April	753,434	127,897	519	881,850	631,769
Total—Four Months	2,857,932	387,646	1,210	3,246,750	2,360,051

1955 U. S. Motor Truck Factory Sales by G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	42,396	15,056	4,059	16,489	4,741	3,279	3,657	89,676
February	30,036	11,277	2,645	11,911	3,870	3,380	3,937	67,081
March	46,616	18,275	4,155	19,176	4,303	3,407	4,720	102,992
April	61,365	22,178	4,834	23,779	5,417	4,230	6,094	127,897
Total—3 Mos. 1955	102,613	66,786	15,693	71,355	18,396	14,276	18,398	387,646
Total—3 Mos. 1954	173,700	70,598	14,258	71,033	18,948	20,611	14,253	381,200

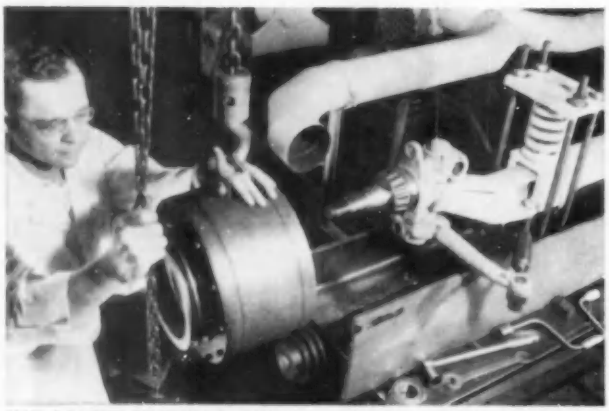
* Automobile Manufacturers Association.

The number with a history



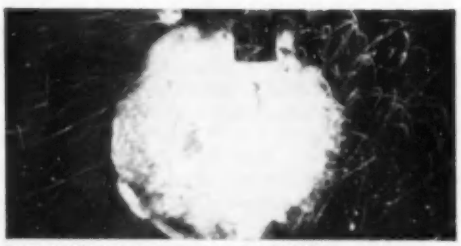
LM11949 ON THIS BEARING CONE, and LM11910 on the cup, identify it as a new low-cost, space-saving tapered roller bearing for front wheels. But with the trade-mark "Timken" also on the bearing, the number has a history of extra quality and service, tells you the new bearing was made by its originator.

SHE USES THIS MACHINE to measure bore size and roundness of Timken® bearing cones in ten-thousandths of an inch. Cones are then sorted into sub-sizes by O.D. and matched with rollers that have also been sub-sized. It's this precision manufacture that pays off in longer life, less maintenance.



WE MAKE SPECIAL TESTS to help automobile manufacturers solve basic design problems. In this simulated service test, we run front-axle assemblies under maximum loads. It tests the bearings under operating loads, compares seals and lubricants, shows customers how to get longer bearing life.

WE CASE-HARDEN EVERY RACE AND ROLLER in the world's largest battery of case-carburizing furnaces. We make bearing parts hard on the outside to resist wear, tough on the inside to take shock. It's another reason Timken bearings are number-one for value in your car's moving parts—the vital zone.



WE MAKE OUR OWN STEEL—to control quality from the start. Shown here: a sample for lab analysis. We're America's only bearing manufacturer that makes its own steel. And we make it nickel-rich for extra toughness. So specify "Timken" with the bearing number. And for *full* value, always use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN is number 1 for VALUE where value counts most... in the vital zone

TRADE-MARK REG. U.S. PAT. OFF.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⇓ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

Men in the News

Willys Motors, Inc. —W. V. Kershaw has been named general service manager.

Eclipse Machine Div., Bendix Aviation Corp.—**James W. Mason** was promoted to general superintendent of manufacturing.

Firestone Tire & Rubber Co.—**Wilbur F. Jordan** has become sales manager of the Synthetic Rubber and Latex Div.

Republic Aviation Corp. — **Richard G. Bowman, Dr. William J. O'Donnell,** and **Robert L. Bortner** were appointed assistant chief engineers for production, development and experimental, and administration respectively.

Electric Storage Battery Co.—**Warren Ingersoll** has been appointed assistant to the president.

Detroit Diesel Engine Div., General Motors Corp.—**Charles W. Frederick** was appointed director of engineering, and **Clyde W. Truxell, Jr.,** works manager.

Ohio Seamless Tube Div., Copperweld Steel Co.—**Glen Hartman** has been made assistant manager of operations.

Convair Div., General Dynamics Corp.—**F. A. Monahan** has been appointed manufacturing and development coordinator at the San Diego plant.

Marquardt Aircraft Co., Accessory Engineering Div.—**Anthony J. Kreiner** has been appointed chief engineer.

Hammond Manufacturing Corp.—**Victor E. Bertrandias** was appointed vice-president.

R. M. Hollingshead Corp., Automotive Div.—J. A. Caskey has been made sales manager.

Potter & Johnston Co.—Edward P. Gillane was named president, general manager, and a member of the board, while Wilfred J. Pender was elected vice-president and factory manager.

Chrysler Div., Chrysler Corp. — **George J. McCarthy** is now assistant sales manager for organization.

Bendix Aviation Corp., Research Laboratories Div.—**Ralph A. Lamm** has been chosen to head special missile development activities, and **Arthur C. Prine** has been named assistant to the general manager.

Parish Pressed Steel Div., Dana Corp.,—**William E. Liesman** has been appointed assistant sales manager.

Dodge Div., Chrysler Corp.—**Walter M. Spencer** has been promoted to director of service.

Ford Div., Ford Motor Co.—**John S. Canterbury** is now manager of the Organization and Systems Dept.

Bryant Machinery & Engineering Co. — **Charles B. Tansley** has been elected president, and **Martin J. Wiora** has been named chairman of the board.

Chrysler Corp. of Canada, Ltd. — **Frank J. Hogan** has become vice-president in charge of Finance.

Purolator Products, Inc.—**Howard J. Hopkins** has been appointed merchandising manager, and **John W. Puth** has been named assistant merchandising manager.

(*Turn to page* 106, *please*)

Ford Motor Co.—George W. Walker has been elected vice-president and director of styling, and Victor Z. Brink has been made styling operations manager.

Studebaker Div., Studebaker - Packard Corp. — Clarence H. Smith was named works manager.

Necrology

F. H. Diehl, 77, head purchasing agent for the Ford Motor Co. from 1911 to 1927, and credited with starting the late Walter O. Briggs, Sr., on the manufacture of closed car bodies, died May 19, at Miami, Fla.

Clarence Kuschel, 49, designer for the Briggs Mfg. Co. and manager of the Motor State Products Div., Detroit Harvester Co., died May 21, in Dearborn, Mich.

Morris M. Miller, 67, treasurer of Waldes Kohonoor, Inc., died May 20, at Forest Hills, N. Y.

Harry O. Ward, 73, veteran official of the former Pierce Arrow Co., died May 23, at Buffalo, N. Y.

William J. Kelly, 56, president, of the Machinery and Allied Products Institute, died May 29, at Chicago, Ill.

Ray L. Newton, 63, assistant general sales manager of Cadillac Motor Car Div., General Motors Corp., died recently, at Highland Park, Mich.

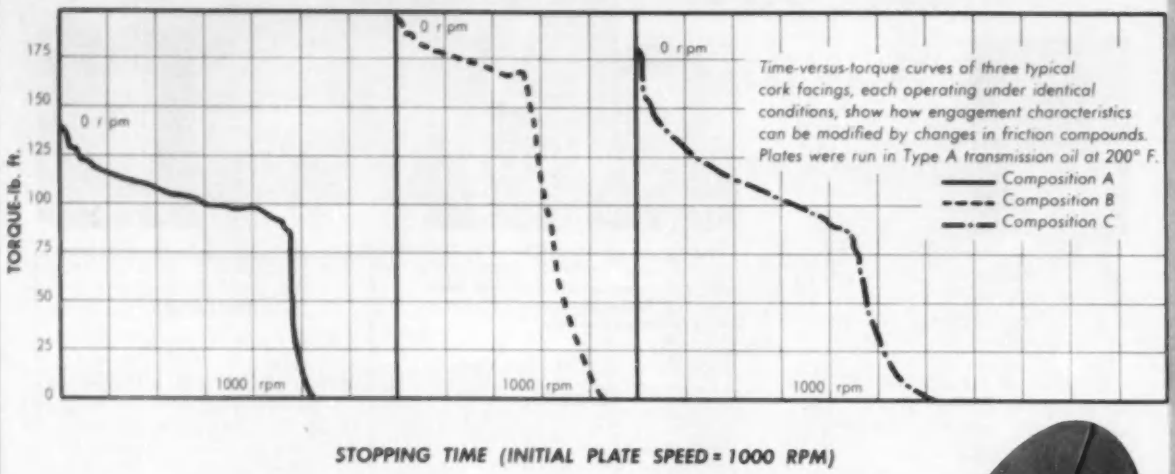
Charles D. Wiman, 63, president of Deere & Co., died recently at Tucson, Ariz.

Joseph P. Glover, 59, executive head of the National Wheel and Rim Association, died recently, at Cleveland, O.

Manuel Ayulo, 33, veteran California race driver, was killed May 17, while practicing at the Indianapolis Motor Speedway for the Memorial Day Race.

Alberto Ascari, 37, professional race driver and head of the Lancia team, was killed May 26, at the Monza Track in Italy.

TYPICAL ENGAGEMENT CHARACTERISTICS OF THREE DIFFERENT CORK COMPOSITION FACINGS



CORK CLUTCH FACINGS:

How engagement characteristics can be controlled by modifying the facing compound

The chart above shows how engagement characteristics of clutches can be modified by slight changes in the cork compound used as a facing. The three test plates were run under identical conditions, but with a different material on each plate.

As these curves indicate, you can expect a marked difference in the type of engagement that each material will produce in a given clutch. This is typical of the wide range of performance characteristics that can be gained through proper compounding of cork friction materials. This unusual versatility makes cork facings adaptable to the varying demands of different mechanical systems.

Cork clutch facings can be made using a variety of resins and rubbers as binders. Precise variations in the kind and amount of binder result in many possible compounds, each differing somewhat in torque capacity, rate of engagement, and degree of slip. Within this wide range of performance characteristics, you can choose an engagement that is smooth and shock-free, or one that is virtually instantaneous, depending on the needs of your particular design.

For more information on the performance versatility of cork-compound friction materials, send for a copy of "Armstrong Resilient Friction Materials." Write on your letterhead to Armstrong Cork Company, Industrial Division, 7206 Imperial Avenue, Lancaster, Pennsylvania.

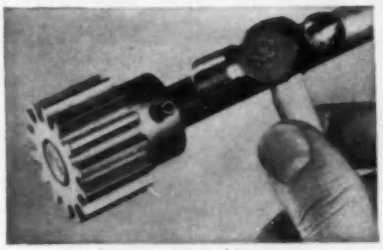
Armstrong FRICTION MATERIALS

. . . used wherever performance counts

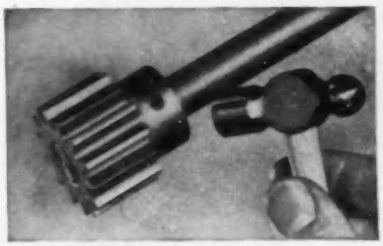
Where can you use this simple fastener?

No threading, peening or precision drilling with ROLLPIN

Rollpin is driven into holes drilled to normal production-line tolerances.



It compresses as driven.



Rollpin fits flush . . . is vibration-proof.

Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

This modern fastener drives easily into standard holes, compressing as driven. Its spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole.

* * *

If you use locating dowels, hinge pins, rivets, set screws—or straight, knurled, tapered or cotter type pins—Rollpin can cut your costs. Mail our coupon for design information.

Elastic Stop Nut Corporation of America, Dept. R16-65
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Please send me the following free fastening information:

☐ Rollpin bulletin
☐ Elastic Stop Nut bulletin
☐ Here is a drawing of our product. What fastener would you suggest?

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Firm _____

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WALLACE BARNES COMPANY
BRISTOL, CONNECTICUT
THE WILLIAM D. GIBSON COMPANY
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RAYMOND Manufacturing COMPANY
CORRY, PENNSYLVANIA
BARNES-GIBSON-RAYMOND
40300 PLYMOUTH RD. PLYMOUTH, MICH.
B·G·R COOK PLANT
ANN ARBOR MICHIGAN
DIVISIONS OF ASSOCIATED SPRING CORPORATION
COAST TO COAST
SEABOARD Coil Spring Div.
15001 S. BROADWAY GARDENA, CALIF.
OHIO DIVISION
1025 EAST FIRST ST. DAYTON, OHIO
WALLACE BARNES COMPANY
STATE FAIR BLVD. SYRACUSE 9 (Salina), N.Y.
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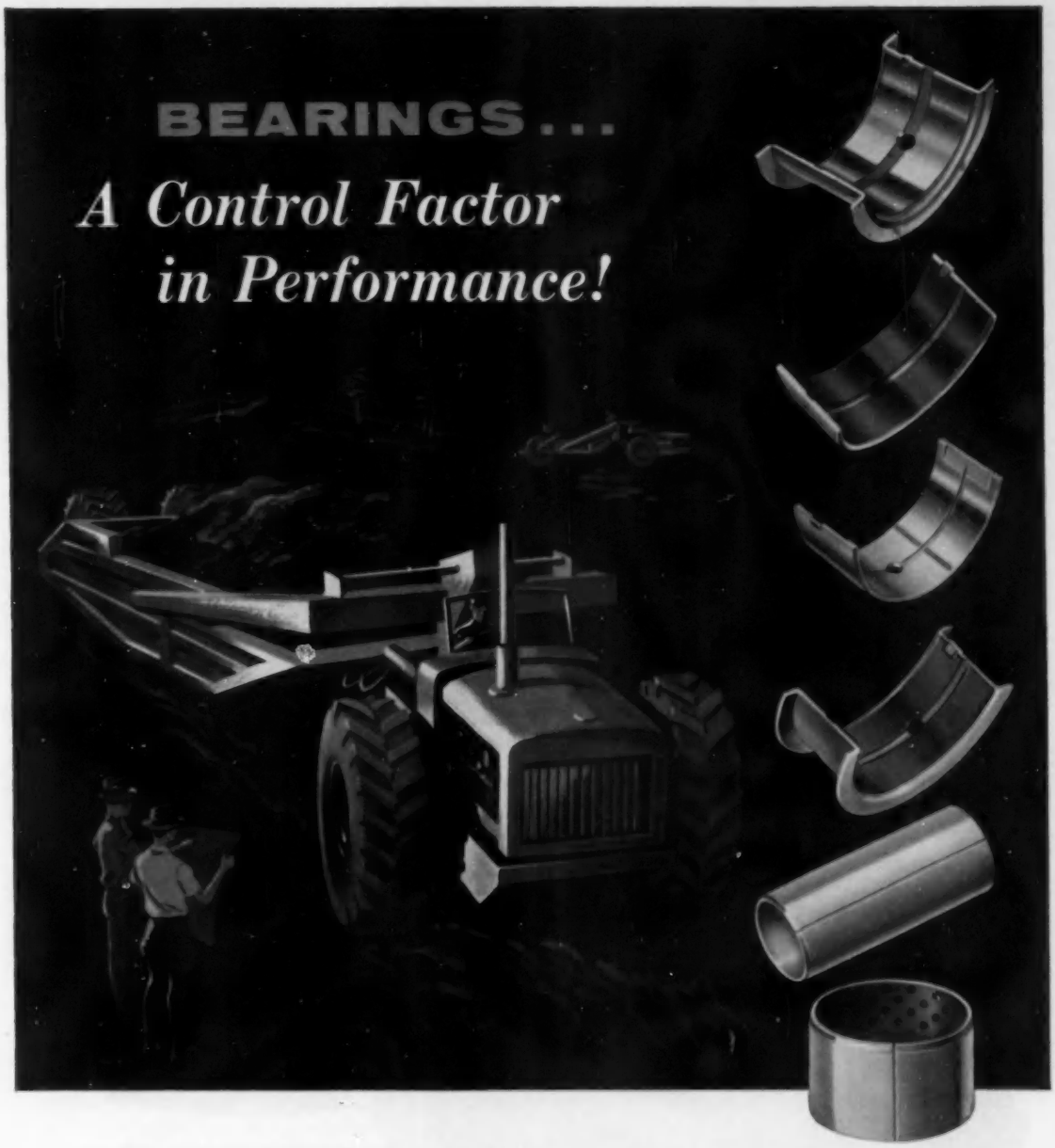
F. H. MANROSS AND SONS CO.
BRISTOL CONNECTICUT
THE WALLACE BARNES CO., LTD.
HAMILTON CANADA
"It's the best brand in the land..."
LET US TUNE UP
YOUR SPRINGS
SMALL STAMPINGS
SPRING WASHERS
WIRE FORMS

BEARINGS...

A Control Factor in Performance!



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Earth-moving equipment demands rugged construction in every part—and sleeve bearings are no exception. They must carry tremendous thrust loads from pistons, protect costly crankshafts from excessive wear, endure extreme heat, maintain internal lubrication and on occasion withstand around-the-clock use and abuse. Quality at every step in their manufacture is essential to their vital role in performance. We are specialists in quality bearings and bushings for engine, transmission and chassis applications, and a major supplier to the earth-moving equipment building industry. Federal-Mogul Corporation, Detroit 13, Michigan.

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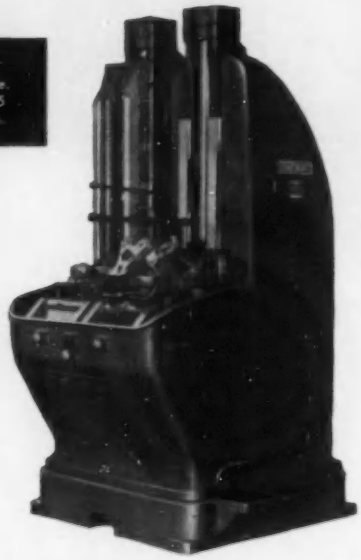
SINCE 1899

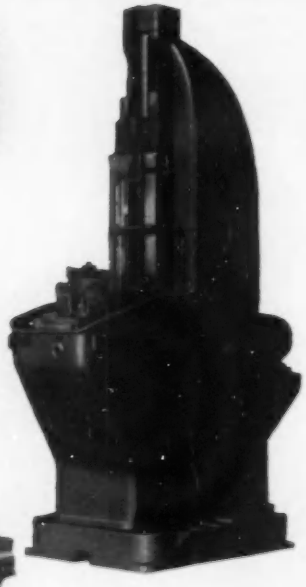
A FASTER *more economical* MACHINE OPERATION

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



THE FOOTE-BURT COMPANY
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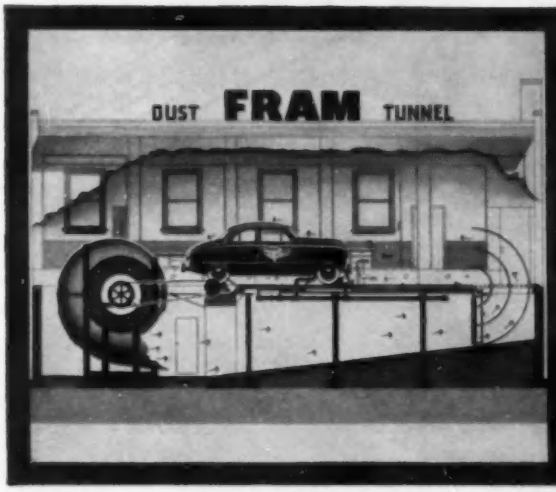
Continuous Type Broaching Machine. Made in 5 Sizes.

FOOTBURT

PIONEERS IN SURFACE BROACHING

FRAM leads the industry



IN RESEARCH . . .

The FRAM Institute of Advanced Filter Research and Design at Dexter, Mich., is the leading research center of its kind in the world. Here, FRAM scientists and engineers study new filtration methods and materials . . . test new systems in the FRAM Dust Tunnel and in actual test-car operation. The facilities of this modern institute and the experience of its personnel are available to help you solve your filtration problems.

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No other filter manufacturer matches the variety and scope of FRAM products—proof of FRAM'S leadership in design. FRAM engineers also work closely with automotive manufacturers in designing special filter systems to exact automotive specifications and requirements. Whatever your filtration needs in . . . oil, fuel, air or water . . . consult FRAM.

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FRAM CORPORATION,
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From Canada Ltd.,
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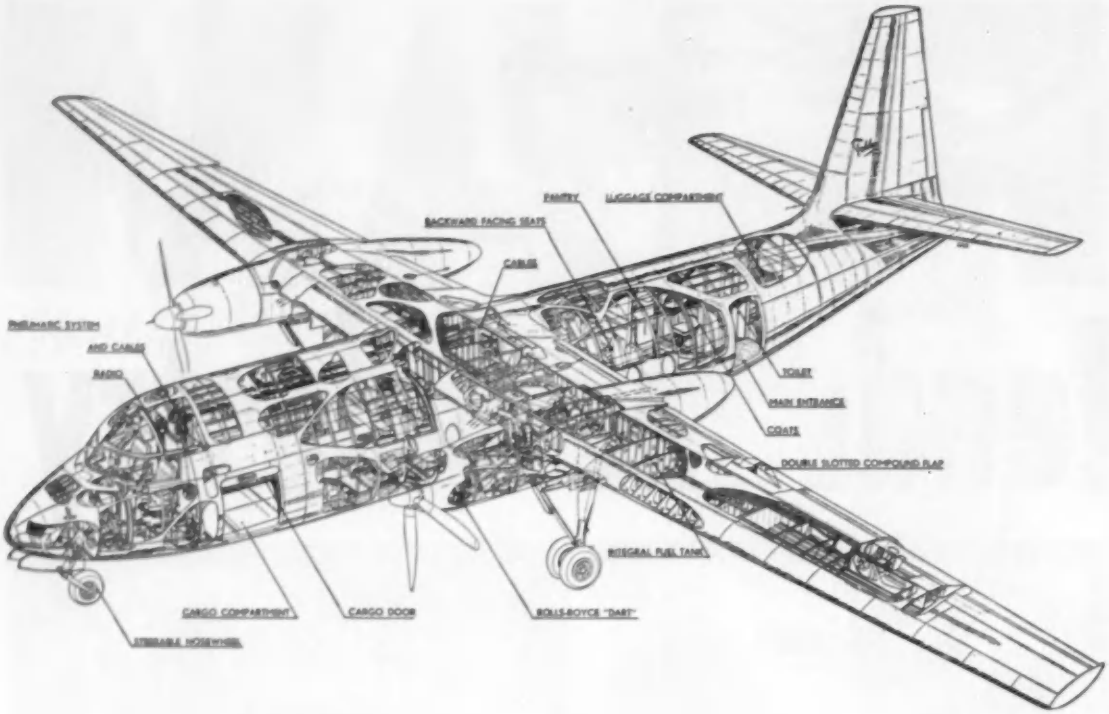


The Fokker F-27

Fokker Planes To Be Built in United States and Brazil

BASIC SPECIFICATIONS OF THE F-27

Span	95 ft
Length	73 ft
Wing area	754 sq ft
Normal take-off weight	32,630 lb
Fuel capacity	845 US gal
Passenger seating	28–36
Payload (28 passengers and cargo)	7,917 lb
Wing loading	43.3 lb/sq ft
Power loading	9.7 lb/ehp
Max cruising speed at 20,000 ft	280 mph
Max stage distance	830 miles
Normal stage distance	300 miles

DESIGN FEATURES OF THE FOKKER F-27

By David Scott

THE Fokker F-27 Friendship, which is to be built under license in America by Fairchild, is a medium-range airliner designed as a modern replacement for the older types of commercial planes in this class. It is a high-wing turboprop powered by two Rolls-Royce Dart engines (RD a 6 rating) each developing 1550 shp plus 365 lb thrust static take-off power at sea level.

Standard cabin seating capacity is 28, but alternative arrangements may be made for 24, 32 or 36 passengers by moving the front and rear cabin bulkheads and repositioning the pantry. Seats are normally

faced rearwards, and Fokker claims several other safety features for the F-27. For example, fire hazards are reduced by the use of kerosene instead of gasoline, by locating the two fuel tanks in the outer wings, and by pneumatic operation of the retractable tricycle undercarriage and wheel brakes.

The fuselage, pressurized to maintain a cabin altitude of 8000 ft at a height of 20,000 ft, is built in two sections. The forward one consists of cockpit and cargo compartment, the latter with a reinforced floor of 100 psf load capacity. Cargo door on the port side is self-sealing and slides upwards to open. The detachable nose with nose-wheel doors is made of reinforced plastic.

The main fuselage is of circular section flattened beneath the cabin floor. Bottom panels are braced by crash members to which the passenger seats are attached, enabling these to withstand 20 g deceleration. Double floor of sandwich design gives added rigidity. Air conditioning equipment is in the tail. Construction is largely of 24ST aluminum alloy, although the wing attachment brackets are 65ST aluminum alloy forgings.

The high wing arrangement and low fuselage floor of the F-27 are stated to ease passenger entry and freight handling, making the airliner suitable for short-stage flights, and for operating from fields with limited facilities. In addition, they permit the use of 12 ft diam propellers which increase the take-off thrust. It is also claimed that these design features, together with the relatively low wing, loading and the use of double slotted compound flaps of large span, make possible a low landing speed.

Quantity production of the Friendship was started in January at the main Fokker factory at Schiphol Airport, Amsterdam. Flight testing is planned to begin this summer. Royal Dutch Airlines (KLM) have already placed an order for these airliners.

THREE FOKKER MODELS FOR BRAZIL

By L. M. Peppercorn

Fokker S.14 jet trainer

RIO DE JANEIRO

IN 1951-52 the Brazilian Government, represented by the Air Minister, and the N.V. Koninklijke Nederlandsche Vliegtuigenfabriek Fokker of Amsterdam, Holland, entered into negotiations regarding the supply to, as well as the production of, Fokker airplanes in Brazil. During these negotiations Fokker Amsterdam decided to establish in Brazil a subsidiary company, Fokker Rio, for which the capital should be supplied 50 per cent by Fokker Amsterdam and 50 per cent by Brazilian shareholders. The establishment of a subsidiary company was connected with a contract to be made between Fokker Rio and the Brazilian Air Ministry for the supply and manufacture of a number of advanced trainer airplanes—types S.11, S.12 and jet trainer type S.14—of which the first two are equipped with Lycoming engines and the jet planes with Rolls-Royce Derwent engines.

Negotiations were finally completed in January, 1953, at which time a so-called basic contract was signed between the Brazilian Air Ministry and N.V. Koninklijke Nederlandsche Vliegtuigenfabriek Fokker for the promotion of a Brazilian air industry. The Brazilian company, called Fokker Industria Aeronautica S.A., was established with a capital of $20 million in which the Brazilian and the Dutch groups shared half and half. The Brazilian investors are largely represented by the industrial group Sampaio, Kann & Co. Ltd. For the practical execution of this project Fokker Rio, on July 15, 1953, signed a contract with Fokker Holland of which the Brazilian Air Ministry was notified officially on October 10, 1953. About one month prior to this, on September 4, 1953, the contract between the Air Ministry and Fokker Rio came into force at which time the subsidiary company of the N.V. Koninklijke Nederlandsche Vliegtuigenfabriek Fokker at Amsterdam—the Fokker Industria Aeronautica S.A.—was officially established in Brazil.

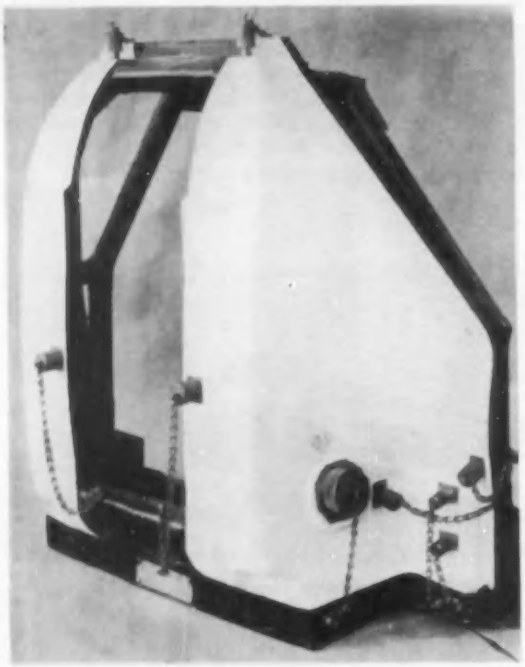
According to the contract signed between the Brazilian Air Ministry and Fokker Rio, it was determined that the already existing airplane plant at the Military Air Base at Galeão in Rio de Janeiro should be used.

The contract foresees the manufacture and delivery within five years of 100 Fokker planes S.11, 50 planes S.12 and 50 jet planes S.14. Jigs and tools, supplied by Fokker Amsterdam, will, according to the contract, become the property of the Brazilian Government. In this way, the Brazilian Air Ministry will retain the right of controlling and verifying the entire cost.

(*Turn to page* 174, *please*)

Chrysler Adopts PLASTIC

for PARTS, DIES, and FIXTURES



1955 Plymouth front and cowl checking fixture complete with plug gages. This is typical of the many inspection fixtures made in the plastics department.

Some of the production parts made in the plastics department. At the top is a portion of the roof panel air conditioning duct assembly.

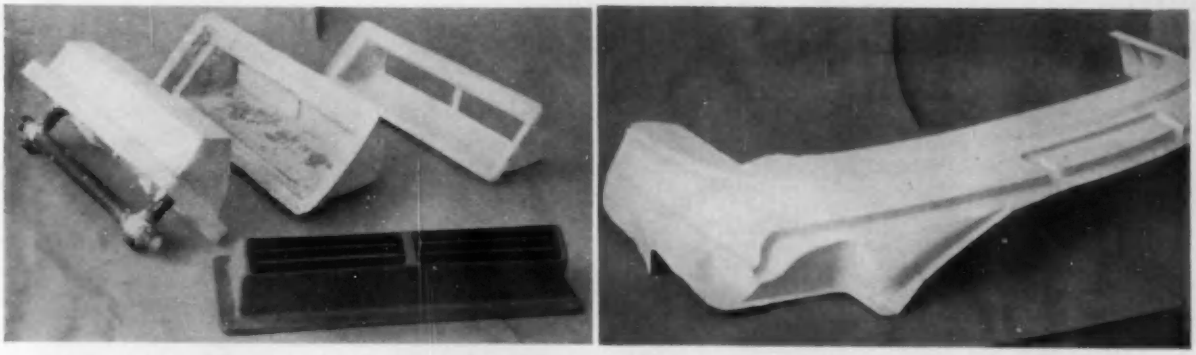
REINFORCED plastic techniques are paying real dividends at Chrysler Corp. in the making of prototype parts for study ahead of production release, in the construction of inspection fixtures for sheet metal parts and other components, and in the making of durable plastic dies for production runs as well as short runs of stampings. As a matter of fact, it is so much easier and quicker to produce plastic dies and parts—taking into account the large investment ordinarily inherent in steel dies—that certain small run production parts have been made in the experimental shop.

It is of interest that the reinforced plastics department has been in business long enough to have experimented with the many varieties of plastics formulations available commercially and has found the most satisfactory results with the use of glass fiber cloth and sheets coated with epoxy resins and hardeners. They employ a simple lay-up procedure, building up the required thickness of material with glass fiber cloth, each layer being coated with epoxy resin. The material is thermo-plastic, hardens at room temperature, and usually does not require oven curing.

Perhaps the most important virtue of plastic tooling is its time saving property. Ordinarily it takes weeks or, in some cases, months to produce metal dies. Yet there are many emergencies at the start of a program that require more immediate action. In such cases the experimental department can easily produce the necessary plastic dies in a matter of hours or a few days, making it feasible to produce a large press run long before the sheet metal dies are ready for try-out.

Incidentally, the epoxy dies are found to be extremely durable, capable of producing relatively large runs without breakage or wear. This characteristic makes them economical for relatively long runs of parts required for a special model or for single model run. One of the recent projects was the manufacture of a complete set of plastic dies for a panel truck body. Since, in this instance, production volume could not justify the investment in metal dies, plastic tooling was responsible for a considerable cost saving as well as an even greater saving in time.

Prototypes of body sheet metal and decorative parts have played an important role in the program, making it possible to study the individual components



Left—Deflector for air conditioning system in Chrysler Windsor is one of the production parts made in the experimental department. The three pieces at the top are sections of the mold. Right—Prototype of a cowl section. Such prototypes are employed in tooling for inspection fixtures and jigs.

Assembly of plastic Plymouth V-8 engine model. This was used for production studies as well as show purposes.

in advance of production release, thus facilitating changes and simplifications from the standpoint of design as well as manufacturing.

Perhaps the best recent example of this feature was the production of a number of V-8 engines assembled entirely from plastic parts, even including the spark plug. Not only did these engines serve as show models, but a study of the components also revealed areas that could be profitably altered before production release. Some of the details not apparent on the drawing board showed up quickly on the model.

Another useful area is the use of plastic fixtures for checking sheet metal parts; and for inspecting vendor items such as bumpers and bumper guards, particularly where a new vendor is involved

Chrysler has found still other avenues that pay off. We refer to the production of short runs and special equipment items directly for production use. In effect, the plastics shop can save considerable time and eliminate the investment in metal tooling by producing plastic parts required in relatively small volume. Current example of this is the manufacture of large air conditioning ducts, quarter panel trim, seat backs, seat supports, and similar items for limousine installations.

At the present time Chrysler is using Ren-ite formulations of epoxy type in the program highlighted above. The reinforced plastic parts have great strength and durability, exhibit complete dimensional stability, and are unaffected by atmospheric conditions. Reinforced plastic dies and punches, usually subjected to high pressures and abrasion, stand up remarkably well and are good for exceptionally long runs. Moreover, they are easily repairable in the event of minor breakage.

It is apparent that the technique holds unlimited potentialities that can be developed with experience. Needless to say, the company is constantly on the lookout for new developments in resins and techniques and is quick to take advantage of these in the interest of furthering the art and its scope.

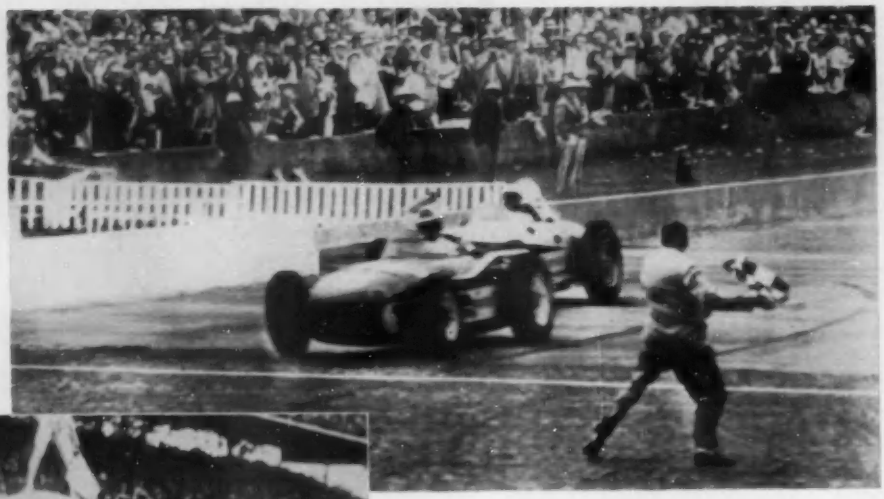
• • •

Allison 501 Turboprop Wins Approval of CAA

Approval of the Allison Model 501 turboprop engine by the Civil Aeronautics Administration signals the way toward a new era in commercial aviation. The M-501, now being offered to U. S. airlines and airframe manufacturers, is a commercial version of the Allison T56 turboprop now being built for Lockheed C-130 four-engine Air Force transports.

Officially qualified at 3750 equivalent shaft horsepower, the Allison unit has a high power-to-weight ratio of 2.32 to 1. It was approved just ahead of the British Rolls Royce 1650-hp Dart, which is scheduled to go into service soon on Capital Airlines' Viscount planes.

Although the Model 501 engine has been tested for 10,000 hours by the CAA and the military, it must still undergo further reliability tests, and is not expected to be available for commercial delivery until March 1957.



After being officially flagged as winner of the race, Bob Sweikert refreshes himself with a cold drink. International News photos.

Analysis of the

BOB SWEIKERT, Indiana, won the 39th annual 500 Mile Indianapolis Race handily at an average speed of 128.209 mph. Driving a John Zink Special (a new Kurtis-Kraft type 500 D), Sweikert ran a very competent race and was never far off the pace throughout the event.

Started under ominous and lowering clouds, the race was marred by the tragic death of two-time winner Bill Vukovich. Running a very strong first at the time, Vukovich succumbed on the spot to injuries and burns received when his Hopkins Special hurtled into and over a three-car wreck taking place in his speeding path into the backstretch. The car landed on its back just outside the outer guard rail of the stretch, near the golf bridge, trapping Vukovich beneath it, after striking several parked cars in its flight.

Vukovich was in his 55th lap when the tragedy occurred. He had led all but a few laps of the race from the start, having duelled sharply with Jack McGrath for the lead on several occasions. Fate frowned on Vukovich but was kinder to the three drivers whose cars wrecked in front of him. They escaped with superficial injuries.

From the very start, McGrath—who led the first few laps—and Vukovich put up a terrific tussle for the lead. Vukovich went to the front soon enough after a fierce drive but the temper of their struggle was demonstrated by McGrath when he seized the lead on the fifteenth and twenty-fifth laps. But Vukovich was not to be denied and each time soon repassed McGrath. They were running within a few feet of each other at all times and had almost half a lap on the second place car—when McGrath came in for what appeared to be a pit stop on his 54th lap.

All photographs (except where noted otherwise) and text material for this article prepared exclusively for AUTOMOTIVE INDUSTRIES by Robert T. Jackson, Perfect Circle Corp. The author gratefully acknowledges the information received from and cooperation extended by Messrs. Pemberton, Rodgers, and Silberman, of the AAA Technical Committee; C. Rigsbee, Director of Timing and Scoring; and Paul Johnson, Assistant Steward, AAA.

By
Robert T. Jackson
Perfect Circle Corp.

Bob Sweikert, the winner, in his second (and final) pit stop. A change of tires and refueling cost him less than a minute.

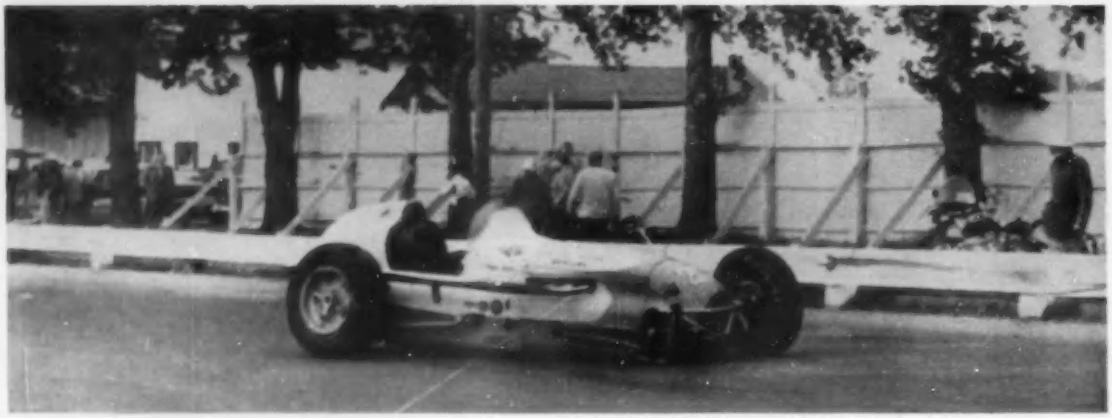
Results at Indianapolis "500"

The pit stop turned out to be McGrath's elimination from the race with a burned piston. The narrow breadth of his escape from involvement in the multiple wreck that was fatal to Vukovich was dramatically displayed on the scoreboards — which showed that McGrath had completed 54 laps while Vukovich's number counted 56 laps to its credit. If McGrath's failing engine had not materialized just when it forced him into his pit he almost surely would also have fallen victim to the four car wreck.

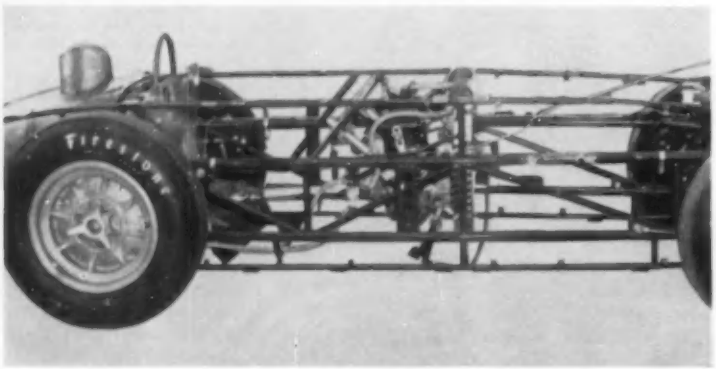
Voiceless but compelling, the figures 54 and 56 remaining on the scoreboards for these two cars were mute testimony to the boon conferred on McGrath by his beneficent Providence in the form of a faltering engine. Their message was correctly interpreted by many sober spectators who soon suspected the grim facts of the Vukovich disaster.

Meanwhile, the race, which, like the show, must go on, had been running under the yellow (caution) signal for many laps. The passing of Vukovich and McGrath's retirement shifted the balance of competition automatically. During the caution period required to clear the course of the wrecked machines, Bryan was the leader and he continued in the van after racing speed was resumed by the display of the green signal. The yellow light was on for about 27 minutes on this occasion, which undoubtedly was responsible

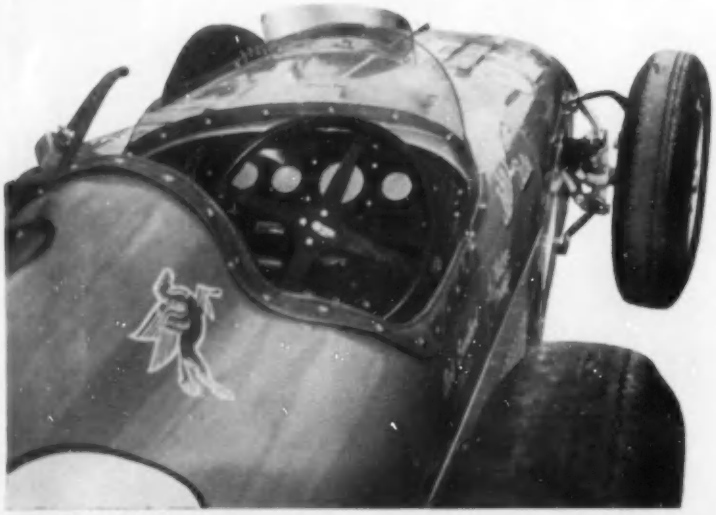
Car driven by Bill Vukovich burns furiously after hurtling wall in avoiding pile-up on backstretch. International News photo.



Car driven by Roger Ward shown facing the wrong way after striking the retaining wall. It was involved in the smash-up in which Bill Vukovich was killed. International News photo.



Chassis body structure of the No. 48 Sumar Special streamliner driven by Jimmy Daywalt.



Bob Sweikert's winning No. 6 John Zink Special ran all the way with its instrument dials blanked out. Don Freeland's Bob Estes Special, a strong contender during the second half of the race until it was eliminated by engine trouble, also ran with instrument dials covered.

for the lower race speed average this year.

Most of the front-runners made pit stops under the yellow flag. When speed was resumed Bryan led until his 90th lap when he arrived at his pit with gestures of resignation. After a lengthy stay while various inspections of his engine were made an unsuccessful attempt to restart it ended in the car being pushed to its garage.

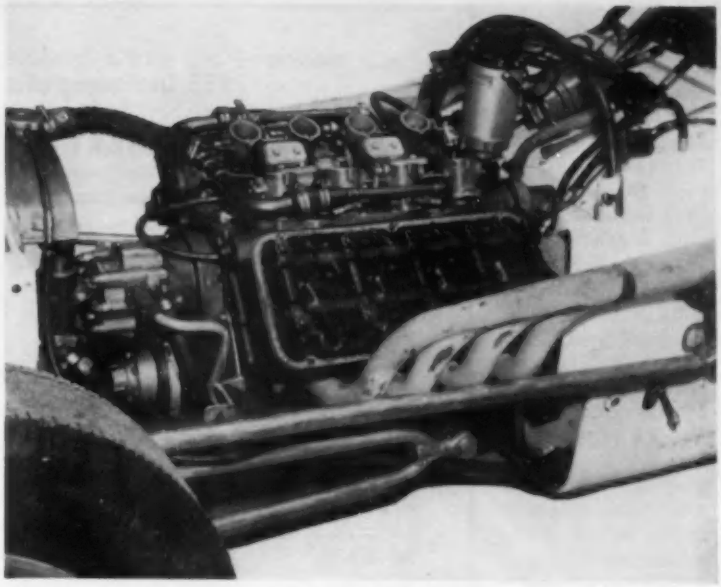
While all this was going on Bob Sweikert had swung into the lead and held it until his second pit stop. At all times throughout the contest Sweikert was within striking distance of the heavy payoff position and should receive credit for managing his respective positions with wisdom and discretion. He was sufficiently wary of joining the battle for the early pace to stay for the strong finish which he put on in the closing stages of the struggle.

When, about three-fourths of the distance, Sweikert made his second pit stop, the lead fell to Art Cross. Cross, running smoothly, it seemed, led comfortably until he was retired by a broken connecting rod bolt, although Don Freeland was in a threatening position in second place at the time. When Cross was forced from the race, Freeland assumed the leadership. It was only temporary, however,

for Freeland made a pit stop and Sweikert again took charge of things 'til the finish.

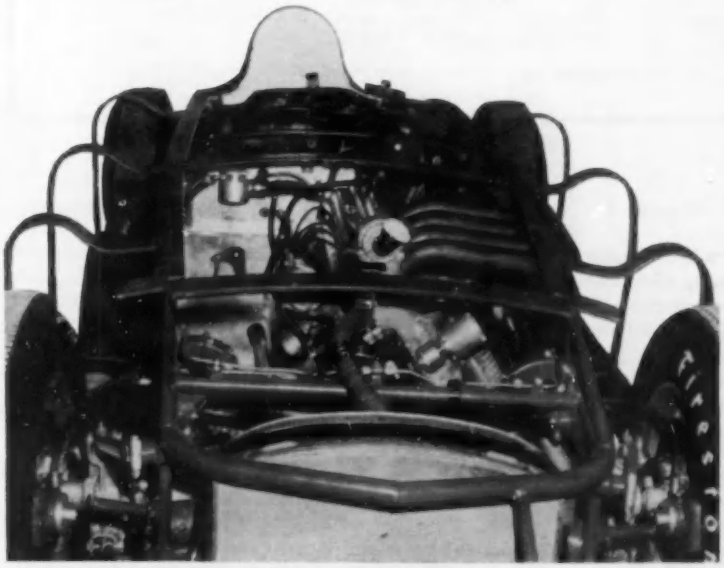
A short while previously, when running among the first five on his 170th lap, Cal Niday had been the victim of a serious wreck in the northwest turn and the yellow light was on again. This was a bad one, and Niday was taken to Methodist Hospital where his condition was announced as critical.

Meanwhile, the various shifts of leadership due to elimination of various cars by mechanical factors had been producing corresponding and rapid changes in the fortunes of cars farther down the line in the first 10. Only about 15 cars were running at this juncture and things were happening with the rapid regularity which, in years gone by, gave Indianapolis a peculiar charm for its more devoted patrons. The lead had changed hands often enough to tickle even the most avid action-seekers and the steady-runners of the day began to come into their own.



This Dodge engine powered car the No. 7 Dean Van Lines Special, lapped at almost 140 mph in practice but was eliminated by a spin in its qualifying attempt.

Sweikert, gambling on a dangerously diminishing fuel supply, sweated it out successfully to the finish flag and drove into the winner's cage with visible elation, having gained an earned victory in the face of hovering tragedy, the most unpleasantly cool race day weather in 500 mile race history, and a tricky wind which was unofficially mentioned as the possible cause of the four car crash in which Vukovich perished.



Skeletal structure of the streamlined body installed on the No. 33 Boland-Miracle Power Special Car.

The action phase of the race can be totted up in this statement: the first fourth was Vukovich-McGrath; the second was mostly Jimmy Bryan, while the last half was all Sweikert—even though he did not lead it completely or continuously he literally dominated it. Also, he was a pusher throughout.

While thus passing from the competitive to the technical aspects of the race, one regrets the necessity to report that, for the second successive year, the starting cars were very much of a sameness in several important respects. All had the same engine, so far as design goes. Again considering design, all had essentially the same rear axle—as well as numerous other components.

Without attempting to present any particular emphasis, one may fairly say that such a condition is unromantic, not to say unprogressive. Just what it actually means right now, or how far it may continue in the present direction, is, of course, very much of a guess.

The trend is clearly shown by some of the data in our table. To select a dramatic example,

one can learn that Kurtis-Kraft built 21 of the 33 starting chassis. Of these 21, 17 were "roadsters." (In the vernacular, any of the K-K 500 series, beginning with the 500 A introduced in 1952, can be dubbed "roadster" but the term is rather particularly applied to the 500 B's, C's, and D's. These were brought out in '53, '54, and '55, respectively.) The roadster is clearly the machine to get around Indianapolis these days and it is no guesswork that the higher speeds the past couple of years have been attained by such machines. Roadsters are not for dirt.

The first 10 finishers in this year's race included eight Kurtis-Kraft cars, *seven* of them roadsters. There were three D's; two each B's and C's. The other K-K design was a 4000 — which can be used on the dirt. The other two of the 10 were by Ed Kuzma and Joe Selnes and are also usable on dirt tracks.

1955 Indianapolis Race Story

SUMMARY OF RESULTS

Start Row	Car No.	Car Name	Driver	Qualifying Speed (mph)	Engine Bore & Stroke (in.)	Laps Completed	Cause of Elimination (or Number of Pit Stops)	Place and/or Average Speed		
1	23	Jim Robbins Spl.	Jerry Hoyt	140.045	4.375x4.500	40	Lost oil	(31)		
	10	Chapman Spl.	Tony Bettenhausen	139.985	4.375x4.500	200	2	(2)	126.733	(2)
	3	Hinkle Spl.	Jack McGrath	142.500	4.312x4.625	54	Burned piston	(26)		
2	14	Federal Engrg. Spl.	Freddie Agabashian	141.933	4.312x4.625	39	Spun out	(32)		
	4	Hopkins Spl.	Bill Vukovich	141.071	4.375x4.500	56	Wrecked	(25)		
	6	Jones & Maley Spl.	Sam Hanks	140.167	4.330x4.625	134	Rear axle gears	(19)		
3	77	Merz Engrg. Spl.	Walt Faulkner	139.782	4.375x4.500	200	3	(5)	125.377	(5)
	19	Massaglia Spl.	Andy Linden	139.096	4.375x4.500	200	3	(6)	125.022	(6)
	22	D-A Lubricants Spl.	Cal Niday	140.302	4.375x4.500	170	Wrecked	(16)		
4	15	Bardahl Spl.	Jimmy Davies	140.274	4.375x4.500	200	2	(3)	126.299	(3)
	1	Dean Van Lines Spl.	Jimmy Bryan	140.160	4.385x4.500	90	Engine trouble	(24)		
	89	Dunn Engrg. Spl.	Pat Flaherty	140.140	4.332x4.625	200	2	(10)	124.120	(10)
5	37	Dr. Sabourin Spl.	Eddie Russo	140.116	4.385x4.500	112	Oil leak	(22)		
	8	John Zink Spl.	Bob Sweikert	139.996	4.310x4.625	200	2	(1)	126.209	(1)
	5	Malloy Spl.	Jimmy Reece	139.991	4.379x4.500	10	Broken conn. rod	(33)		
6	71	Martin Bros. Spl.	Al Herman	139.811	4.332x4.625	200	3	(7)	124.794	(7)
	48	Sumar Spl.	Jimmy Daywalt	139.416	4.375x4.500	200	2	(9)	124.401	(9)
	98	Agajanian Spl.	Duane Carter	139.330	4.395x4.500	186	Flagged	(11)		
7	29	Anoted-Rotary Spl.	Pat O'Connor	139.195	4.312x4.625	200	3	(8)	124.644	(8)
	33	Beland-Miracle Power Spl.	Jim Rathmann	138.707	4.312x4.625	191	Flagged	(14)		
	12	Bob Estes Spl.	Don Freeland	139.096	4.375x4.500	175	Broken trans. case	(15)		
8	42	Sam Traylor Spl.	Al Keller	139.561	4.312x4.625	54	Wrecked	(27)		
	49	Crawford Spl.	Ray Crawford	139.206	4.375x4.500	111	Fuel pump	(23)		
	99	Belanger Motors Spl.	Art Cross	138.750	4.342x4.625	168	Broken conn. rod bolt	(17)		
9	41	Federal Engrg. Spl.	Chuck Weyant	138.063	4.322x4.625	196	Flagged	(12)		
	28	Sumar Spl.	Johnny Boyd	138.961	4.375x4.500	53	Wrecked	(29)		
	16	Trio Brass Spl.	Johnnie Parsons	138.808	4.332x4.500	119	Ignition trouble	(21)		
10	31	McDaniel Spl.	Keith Andrews	138.049	4.312x4.625	120	Fuel pump	(20)		
	66	Pete Wales Spl.	Ed Elisian	135.333	4.368x4.500	53	Stopped at wreck	(30)		
	27	Aristo Blue Spl.	Rodger Ward	138.049	4.342x4.500	54	Wrecked	(28)		
11	81	Central Excavating Spl.	Shorty Templeman	135.014	4.332x4.625	142	Left track in N.W. turn	(18)		
	63	McNamara Spl.	Eddie Johnson	134.449	4.375x4.500	196	Flagged	(13)		
	44	Schmidt Spl.	Johnny Thomson	134.113	4.312x4.625	200	2	(4)	126.241	(4)
				ALTERNATE STARTERS						
	24	Ray Brady Spl.	Len Duncan	133.246	4.312x4.625					
	69	La Villa Spl.	Ernie McCoy	133.038	4.375x4.500					

Note—All engines Meyer-Drake four cylinder units.

Aside from the considerations above, it is advisable to report that fuel at Indianapolis is coming more and more under the "nitro" influence. It is reasonable to expect the use of such additives to increase and the engines probably will be developed further in that direction. As presently used, nitro-methane is successful only in the hands of those who have learned how to blend it and prepare their engines properly. The uninitiated have been uniformly unsuccessful in the use of nitro-methane. In some cases, the cars not only run *slower* but also suffer extensive and expensive damage. Contrasted with such effects is the experience of more than one informed user — in which the performance of their engines is undoubtedly greater with little apparent sacrifice in durability. At the present time very little formal literature exists on the use of this constituent.

Brakes and shock absorber installations on Indianapolis cars are definitely improving. Numerous cars appeared this year with multi-spot brakes. The use of the telescopic type shock absorber appears to be increasing, although they still are used mainly in combination with rotary or piston designs. Perhaps more cars are now using two pairs of telescopic with one pair of rotary units, at each end. In all cases the minimum now appears to be two pairs of shocks, front and rear.

Tires have again undergone a modicum of improvement. Firestone advised they have gone to a better tread thickness and a new tread compound, as well as an increase in section for front tires from 7.10 to 7.60.

(*Turn to page* 188, *please*)

Technical Data on Starting Cars

Car No.	Car Name	Driver	Chassis	Wheelbase (in.)	Dry Weight (lb)	Tire Size	Magneto	Springs
23	Jim Robbins Spl.	Jerry Hoyt	Myron Stevens	99	1900	7.10x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
10	Chapman Spl.	Tony Bettenhausen	500C Kurtis Kraft	96	1960	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
3	Hinkle Spl.	Jack McGrath	500C Kurtis Kraft	96	1980	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
14	Federal Engineering Spl.	Freddie Agabashian	500D Kurtis Kraft	96½	1950	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
4	Hopkins Spl.	Bill Vukovich	500C Kurtis Kraft	96	1825	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
8	Jones & Maley Spl.	Sam Hanks	500C Kurtis Kraft	96	1945	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
77	Merz Engineering Spl.	Walt Faulkner	500C Kurtis Kraft	96½	1720	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
19	Massaglia Spl.	Andy Linden	4000 Kurtis Kraft	96	1670	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Long. Tor. Bar
22	D-A Lubricants Spl.	Cal Niday	500B Kurtis Kraft	97½	1700	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
15	Bardahl Spl.	Jimmy Davies	500B Kurtis Kraft	96½	1650	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
1	Dean Van Lines Spl.	Jimmy Bryan	1955 Kuzma	96	1800	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Trans. Tor. Bar
89	Dunn Engineering Spl.	Pat Flaherty	500B Kurtis Kraft	96	1700	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
37	Dr. Sabourin Spl.	Eddie Russo	Not Stated	....	1750	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
6	John Zink Spl.	Bob Sweikert	500D Kurtis Kraft	96½	1650	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Long. Tor. Bar
5	Malley Spl.	Jimmy Reece	Pankratz-Kuzma	96	1953	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
71	Martin Bros. Spl.	Al Herman	Joe Selnes	96½	1640	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
48	Sumar Spl.	Jimmy Daywalt	500DS Kurtis Kraft	96	2000	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
98	Agajanian Spl.	Duane Carter	Kuzma	96	1640	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
29	Ansted-Rotary Spl.	Pat O'Connor	500D Kurtis Kraft	96½	1830	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
33	Belond-Miracle Power Spl.	Jim Rathmann	500B Kurtis Kraft	96	1925	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
12	Bob Estes Spl.	Don Freeland	Watson-Phillips	96½	1800	7.60x16-Fr. 8.00x16-R.	Scintilla Vertex	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
42	Sam Traylor Spl.	Al Keller	1948 Kurtis Kraft	96	1670	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
49	Crawford Spl.	Ray Crawford	500B Kurtis Kraft	96	1850	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
99	Belanger Motors Spl.	Art Cross	500D Kurtis Kraft	96½	1850	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
41	Federal Engineering Spl.	Chuck Weyant	Mod. 3000 Kurtis Kraft	96	1620	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Long. Tor. Bar
39	Sumar Spl.	Johnny Boyd	500C Kurtis Kraft	96	1830	7.60x16-Fr. 8.00x16-R.	German Bosch	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
16	Trio Brass Spl.	Johnnie Parsons	500D Kurtis Kraft	97	1825	7.60-x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Diag. Tor. Bar R.-Trans. Tor. Bar
31	McDaniel Spl.	Keith Andrews	Mod. Gordon Schroeder	96	1795	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
68	Polo Wales Spl.	Ed Elisian	4000 Kurtis Kraft	97	1750	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Long. Tor. Bar
27	Arieto Blue Spl.	Rodger Ward	Kuzma	96	1800	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
81	Central Excavating Spl.	Shorty Templeman	Floyd Trevis	96½	1620	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
83	McNamara Spl.	Eddie Johnson	Own	97	1700	7.60x16-Fr. 8.00x16-R.	German Bosch	Fr.-Trans Leaf R.-Long. Tor. Bar
44	Schmidt Spl.	Johnny Thomson	Kuzma	96	1620	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long Tor. Bar.
			2 ALTERNATE STARTERS					
24	Ray Brady Spl.	Lee Duncan	4000 Kurtis Kraft	96½	1670	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar
69	La Villa Spl.	Ernie McCoy	Templeton	96¼	1660	7.60x16-Fr. 8.00x16-R.	Joe Hunt	Fr.-Trans. Leaf R.-Long. Tor. Bar

Above data obtained from records of AAA Technical Committee as of May 29.

All cars rear drive. All engines Meyer-Drake "270" four cylinder. All used Hilborn fuel injectors and methanol-base fuel. All engines listed as equipped with Champion spark plugs. (Unofficially, we were advised that cars No. 1 and No. 23 used Lodge spark plugs.)

All engines used Perfect Circle piston rings except the No. 19 Massaglia Spl. driven by Andy Linden, which had Grant rings.

All cars used Mobiloil (BB) and Mobil Racing Fuel except:

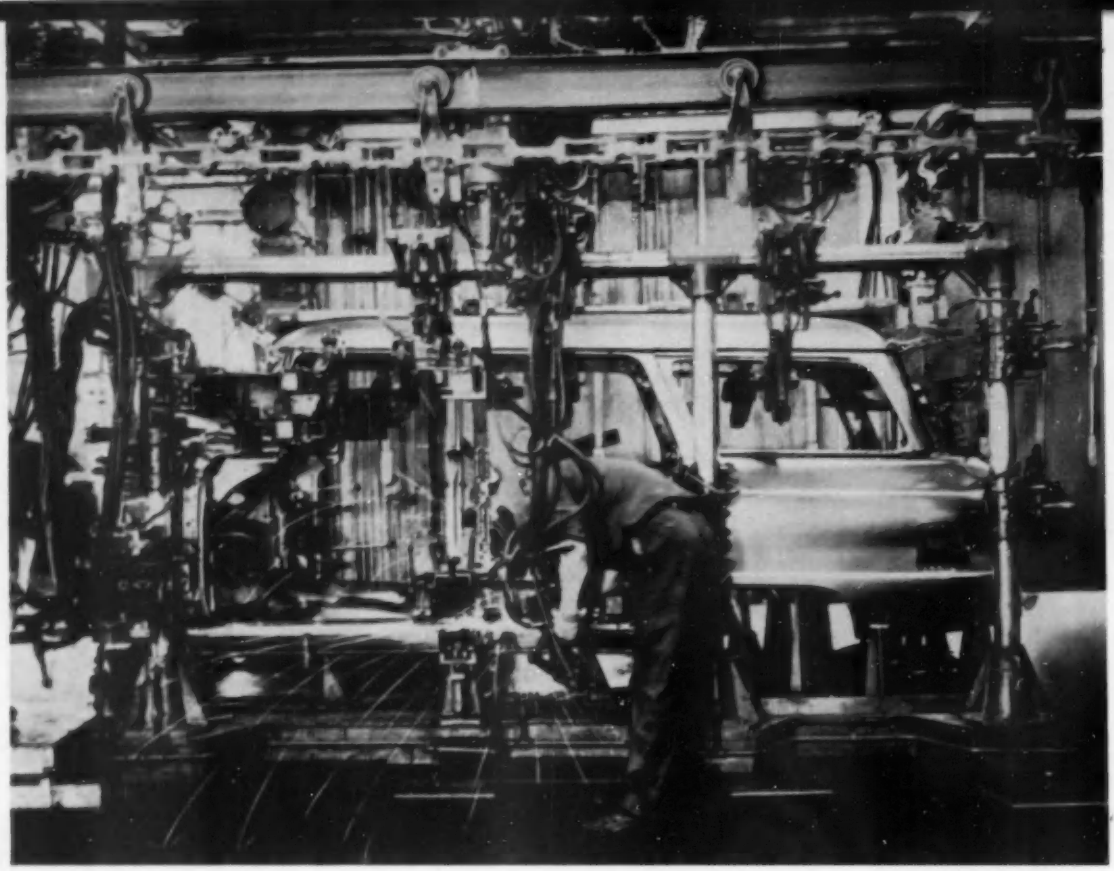
No. 15 Bardahl Spl.—using Bardahl lubrication and fuel of own choice.

No. 22 D-A Lubricants Spl.—using D-A lubrication and fuel of own choice.

No. 33 Belond-Miracle Power Spl.—using Miracle Power lubrication and fuel of own choice.

All cars had spot brakes. All cars used magnesium disk wheels except the No. 23 Jim Robbins Spl., which had wire wheels on the rear.

Most "Joe Hunt" magnetos were basically Bendix-Scintilla.



Master framing fixture for Mercury station wagon bodies. In general design and arrangement of welding tools this fixture is quite similar to those used in body plants in the industry. As a matter of fact, such major fixtures are usually designed in cooperation with the customer's engineers.

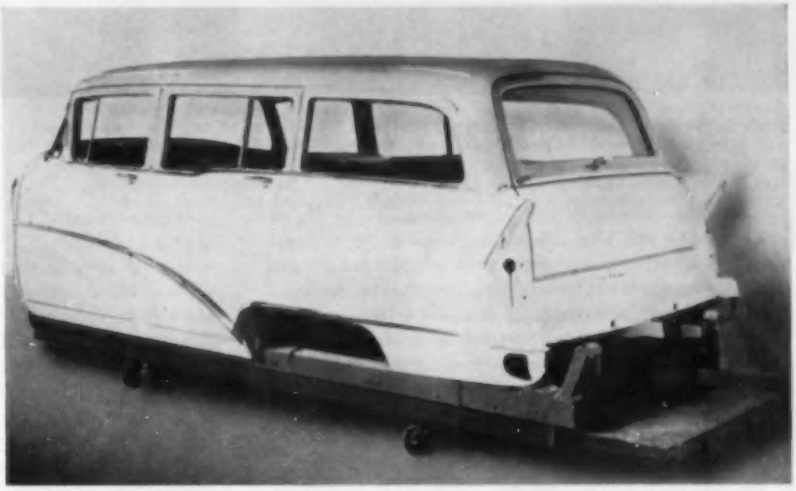
Mass Production Techniques at Station Wagon Body Plant

DISTINCTIVE example of an automotive supplier serving passenger car, truck, and bus manufacturers is the Ionia Mfg. Co., division of the Mitchell-Bentley Corp., at Ionia, Mich. According to Don R. Mitchell, president of the corporation, Ionia has the distinction of being the largest independent producer of completely finished and trimmed station wagon bodies in the field today. He estimates the company will produce over 30,000 station wagon bodies for the 1955 model year.

Currently Ionia is producing station wagons for Buick and Mercury, complete in every detail, ready for installation on final assembly lines at the factories and designated assembly plants. It is of interest that in this respect the company serves the function of a specialized body plant department of each customer, building bodies according to factory specifications, and subject to the same schedules as are the various departments of each assembly plant. Deliveries to Buick in Flint and Mercury at its assembly plant in Wayne are made by truck; deliveries to assembly plants at various points in the USA are made by rail according to schedule.

In addition to the production of station wagons—all steel of course—Ionia operates extensive facilities for the manufacture of autobody trim in the gamut of wanted materials. These facilities are employed in the making of interior trim for station wagons but, in addition, they are also available for other purposes. For example, the company makes trim assemblies in

By Joseph Geschelin



Above is shown the shape of the Buick four-door sedan sub-assembly as shipped to Ionia. Below is how the Buick Estate Wagon looks painted and trimmed, ready for finishing touches before shipment to Buick assembly lines.

leather and vinyl for Studebaker; and trim items for the Nash Rambler.

It is of particular interest to find that the company has extensive manufacturing facilities, the Ionia operation alone accounting for some 1,500,000 sq ft of floor space, with an additional 400,000 sq ft at Owosso.

Between the two operations, employment is currently running around 2800 production workers.

It is an accepted fact that modern body manufacturing requires an enormous amount of floor space for fabrication, body - in - white, metal cleaning, painting and drying, and for trim and hardware installation. Not only does Ionia have adequate floor space for its current projects but it is equally impressive to find the same mass production techniques and new process equipment and fixturing as one will see in a large autobody manufacturing establishment.

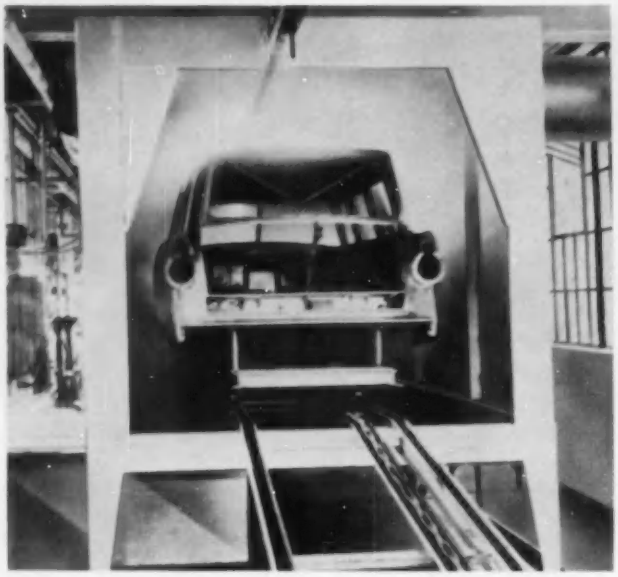
We have selected a group of illustrations that tell the story more effectively than a word picture. It will be recognized that the design of master framing fixtures for body assembly are similar to those in large Detroit area plants, and the same methods are employed for resistance and torch welding, soldering, and body-in-white operations.

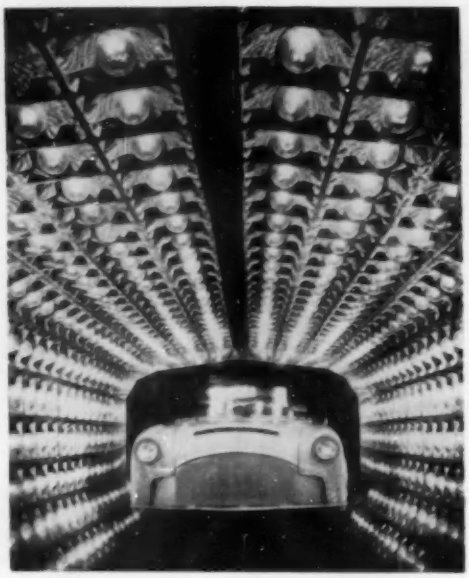
Metal cleaning is done in a large five-station Bonderite unit built by Newcomb-Detroit. Painting and drying are done in modern Newcomb-Detroit equipment of recent vintage. Whereas the drying of Mercury bodies is done in gas-fired ovens, drying of Buick Estate Wagons is done in a large infra-red booth.

Bodies are painted and trimmed according to specifications in solid body color, in two-tone effects, and in the case of certain Mercury bodies with Di Noc effects in addition to two-toning. In the latter case, the bodies go through the paint and drying cycle three times.

Distinctive feature of the entire operation lies in the fact that although it is geared for handling relatively small volume production—even in job lots—the methods and equipment and fixturing are a mass-production character. Thus the company can produce a job of custom character with the economy of mass production. This is particularly true of trim since it is handled by capable and skilled operators.

The flexibility and versatility of this operation and its management make it economical to do things that simply cannot fit into the production scheme of a large body builder. Let us cite the Buick Estate Wagon as an example. *(Continued on next page)*





Modern equipment for the paint department has been installed by Newcomb-Detroit. Left—One of the most distinctive of these is the five-stage Bonderizing unit. Right—Painted Buick bodies are dried in this big infra-red tunnel type oven.

Since the volume of station wagons of the Buick price class is small by comparison with Buick production, it would have been even more expensive to make the mass production press dies for strictly station wagon panels, door and roof panels. Ionia has found it feasible to take a standard four-door sedan Buick underbody sub-assembly, as illustrated, consisting of the underbody, side panels, and cowl assembly directly from Fisher Body and then do the hand work necessary to convert it to a station wagon body. To this end, the section of the roof rail starting at the B-post is cut off, then a new roof rail of suitable formation is securely welded in place. Similarly some of the formation at the wheel house is removed and replaced by suitable panels to establish the station wagon side panel formation.

Ionia also takes the standard sedan rear door, removes the curved rail formation and welds a square-cornered rail to develop a rectangular-shaped door. Such operations are performed rapidly and with adequate economy in the metal finishing shop. The roof panel, in turn, is purchased by Ionia from a local press shop at a cost that could not be justified by production tooling in a large body press shop.

Mercury bodies, on the other hand, are received in completely knock-down condition and assembled in a massive framing fixture designed cooperatively with Mercury engineers.

While on the subject of fixturing it is noteworthy that all framing fixtures, although of basic mass production character, nevertheless are designed for maximum flexibility. They can be readily changed over for an entirely different type of body simply by removing certain elements and replacing them with others. Here again they gain in economy by improvisation.

Small volume and flexibility also are an important asset when it comes to producing a completely finished body ready for the body drop on a final assembly line. In contrast to more rapidly moving mass production assembly lines, it is economically feasible to install any kind of trim, instrument panel, wiring harness, radio, heating and ventilating equipment, power brakes, etc., directly on the custom assembly line without slowing down its operation.

Those familiar with automotive plant scheduling will appreciate the enormous amount of detail embodied in the finished station wagon, taking into account all of the possible combinations of paint, trim, and accessory items being made available. To point up just one item, the company claims that the installation of instrument panels alone—with the possible variations in color, instruments, clocks, etc., amounts to at least 400 combinations.

Besides the manufacturing activity pictured so briefly in the foregoing, the company has become an acknowledged specialist in the design and fabrication of reinforced plastic bodies—experimental models, prototypes, and small lot show models. They have produced the Caribbean and Panther sports models for Packard and are prepared to make small runs of special custom jobs of this character for the industry.

U. of M. Engineer Envisions Electric Cars by 2000 A.D.

A prophecy that electric automobiles may return to the highways by the year 2000 has been made by George Granger Brown, engineering dean of the University of Michigan. Instead of using storage batteries, however, as some cars did at the turn of the century, the new electrics may receive power from central atomic power stations, Dean Brown forecasts.

Advances in HYDRAULICS *analyzed at* Conference in Detroit

Speaker and co-moderators at the conference with a Vickers vice-president. (Left to right—standing) J. F. Forster, vice-president and assistant general manager of Vickers Incorporated; A. J. de Matteo, chief engineer for Watson-Stillman Co. Division of H. K. Porter Co., Inc. (seated) R. E. Russell, master mechanic of Chrysler Corporation's 9-Mile Road Press plant; and D. J. Davis, the keynote speaker, vice-president—manufacturing—of Ford Motor Co.

By Joseph Geschelin

EXPANDING the scope of its important service to the mass production industries, Vickers, Inc., sponsored the first Fabricating Machinery Hydraulics Conference in Detroit May 17 and 18. This is expected to be a biennial event, alternating with the Vickers Production Machine Tool Hydraulics Forum. These conferences have been so informative and so helpful to everyone concerned that Vickers found it necessary to shift the scene of operations to the Statler Hotel ballroom to accommodate a gathering of over 140 guests, representing the master mechanics, plant engineering, and maintenance departments of automotive producers.

Although the present conference covered only such equipment as hydraulic presses, resistance welding machines, plastic molding equipment, die casting machines, metal powder presses, etc., the audience was composed of men interested in the gamut of hydraulic system applications and the tenor of discussion ranged over every practical aspect of everyday problems.

Keynote of the meeting was found in comments made by D. J. Davis, vice president-Manufacturing, Ford Motor Co., in a prepared address. He stressed the need for teamwork among the many interested groups; the automotive manufacturers, machine tool builders, suppliers of hydraulic systems and components, makers of tools and dies, and parts suppliers. The automation practices of today with the enormous outlay by the manufacturer demand an extension of the teamwork practiced up to now within the organization of the user.

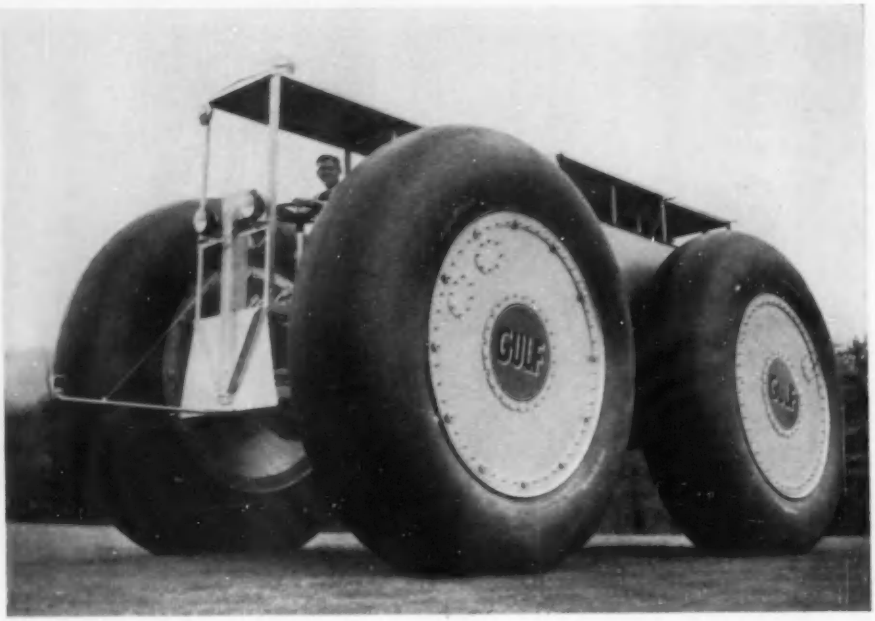
Davis noted that Ford Motor Co. alone has invested $1.7-billion in new equipment since 1947 and is committed to spend around $625-million during the next two years. Investment of this magnitude makes it imperative to keep production lines running without stoppage for any cause. It means that from now on all of the suppliers of machinery, cutting tools, dies and fixtures, hydraulic systems, etc., must team up to create designs that feature reliability, anticipating troubles that lead to down time, designing them out of the equipment and its controls.

Scanning the extensive agenda that established the ground rules for the conference, it was possible to discern some basic trends in the field of hydraulics applied to mass production equipment. Suppliers and users alike agreed that ways must be found to effect further improvement in the design of hydraulic systems and components, particularly in the simplification of the various elements. Preventive maintenance is seen as the major key to successful operation.

Among the general classes of items on the agenda, we may mention the following: circuit and system problems; pump and valve design; fluids; strainers and filters; maintenance; manifolds, cylinders; fitting and tubing; heat exchangers; and seals.

Since the agenda comprised a host of detail problems, this report will touch primarily upon the broader aspects of the range of discussion. For example, the users agreed that oil leaks constitute a major problem —and sometimes a costly one. Among the obvious remedies was strict conformity to JIC standards, simplification of plumbing lines, and elimination of threaded connection wherever feasible. In this connection it was pointed out that flanged joints, using suitable O-ring seals, will provide at least a major part of the answer.

(Turn to page 124, please)



Gulf Marsh Buggy is a giant vehicle designed to provide flotation in the wheels for traversing marsh areas encountered in petroleum exploration operations. Power plant is a Ford V-8 106-hp truck engine.

PART II

Rapid Growth of Off-the-Highway Vehicle Industry

By Andrew W Shearer

Self-Propelled Machines Used in Wide Variety of Applications

THE first section of this two-part article on special automotive-type vehicles as used for general "off-the-highway" purposes (See AI, Feb. 15, page 58) was devoted to a detailed study of the numerous varieties and widespread applications of construction machinery. Such mobile equipment as cranes, tractors, motor graders, trenching machines, and allied units were defined, and their uses in such fields as roadbuilding, agriculture, petroleum, mining and quarrying, logging, materials handling, etc., were enumerated.

This portion of the article, while re-emphasizing the frequent adaptability of basic construction machinery to many important functions in the aforementioned industries, above and beyond those which are strictly "constructional" in nature, will focus primary attention on other special automotive-type vehicles employed for operational purposes alone. Here again, stress will be laid on that equipment which is self-propelled and neither mounted on nor attached to another prime mover.

AGRICULTURE

Agriculture in the U. S. today is big business. Family farms are becoming steadily larger, as the number of workers on farms decreases and as mechanization on the farm continues at a rapid pace. It is estimated that the current total value of the U. S. agricultural plant is in the neighborhood of $157 billion, or a national average worth of $30,000 per farm.

The end result of agricultural mechanization has been an appreciable rise in the productivity of farm labor and a rising standard of living for the American farmer. In 1953, for example, farm output averaged 44 per cent above the period 1934-39. This increased productivity resulted from the use of nearly 90 per cent more power and machinery on farms.

According to the latest estimates, each agricultural worker in the U. S. today produces enough food and fiber to support at least 15 persons. He has an estimated 33 hp at his command,

whereas in 1920, he had only 5.3 hp and in 1870, only 1.6 hp. The average U. S. farm currently has more than $2,000 invested in power and machinery per worker, as compared with less than $300 per worker in 1940.

The demand for farm products is expected to rise 40 per cent over the next 25 years. Most of the needed increase in agricultural production can and should come from even wider applications of technology. Greater applications of power to farm operations will play a fundamental role in the achievement of this goal. Keeping this factor in mind, we may proceed to examine present types of farm equipment in the light of their current capabilities and the refinements they may undergo in the future.

Tractors

The agricultural tractor can reasonably be described as the farmer's most basic helpmate. It serves as an ideal carrier for many types of mounted and semi-mounted implements, such as cultivators, planters, pickers, mowers, listers, bedders, lift plows, and many others. In 1950, more than 90 per cent of all small grains were harvested with tractor power, and more than 80 per cent of all remaining forms of work on the Nation's farms was done with tractors.

Since 1940, the number of tractors on U. S. farms has increased 200 per cent, while the number of horses has undergone a decline of 80 per cent. It is estimated, for example, that during the 1950 season there were approximately four million tractors in use on U. S. farms, and this total has grown appreciably since that time.

Major characteristic of all the various sizes and types of tractors available to the farmer today is capacity—horsepower, speed, and weight. On this score, the trend to greater horsepower in automobile engines has been paralleled in tractors. In 1941, for example, 89 per cent of all tractors produced were rated at under 30 bhp, while the remaining 11 per cent were 30 bhp and over. In 1950, however, 69 per cent were under 30 bhp, but 31 per cent were larger.

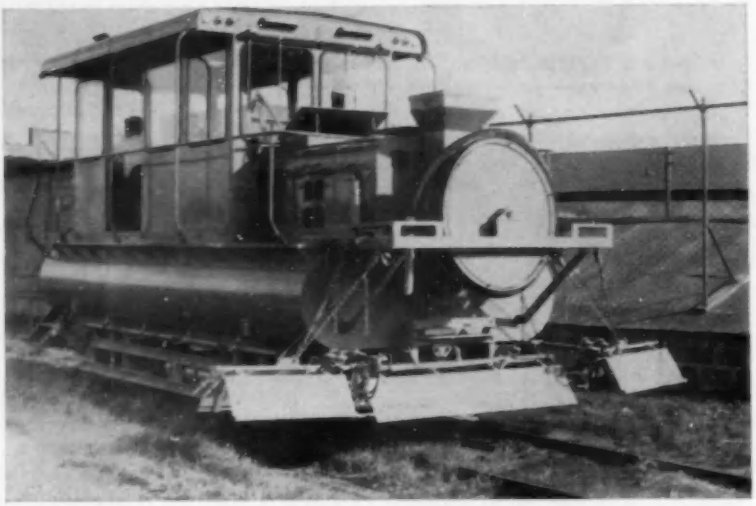
It is highly conjectural whether gas turbines or atomic power plants will replace piston engines in farm tractors during the next two or three decades. The relatively low power ranges of farm tractors, as compared to aircraft, for example, plus the need for economy and efficiency, would appear to constitute a barrier to their adaptation in the near future. However, it is probable that the years ahead will see an increasing use of Diesel engines in farm tractors as more and more design and manufacturing economies are effected. *(Continued on next page)*

Two methods of hauling logs from the woods are depicted in these photos. Right—LeTourneau-Westinghouse Model C Tournapull, fitted with a logging arch, has the following Diesel power plant options: GM 6-71 six-cylinder, 208-hp engine; Cummins HBIS-600 six-cylinder, 200-hp engine; and Buda 6 DA-844 six-cylinder, 200-hp engine. Bottom—45-ton Thew Lorain Model MC-824 Moto-Crane, equipped with 38-ft gooseneck heeling boom, is powered by a Waukesha WAKD six-cylinder, 225-hp Diesel engine.

As far as tractor design itself is concerned, drive wheels in tandem, with transmission steering, instead of the customary front wheels, may come into use for the large standard-tread wheel tractors that are employed to pull large drawn machines.

Similarly, while many such devices are offered now, it is expected that nearly all general purpose tractors of the larger sizes will in the future have some sort of power steering arrangement as optional equipment.

Considerable progress has been made in the development of a common attaching means for integral implements as part of a farm tractor. It is expected that the future will see even more advances in easier attachment, elimination of interferences between tractor hitch parts and various implement components, and better gaging properties.



Shown here are two types of equipment made by Fairmont Railway Motors, Inc., for railroad maintenance. Above is W66 Series B Weed Spray Car, powered by a Waukesha six-cylinder, 130-hp engine. Pumps are driven by twin two-cylinder, 11-hp

Self-Propelled Equipment

While a tractor with integral implements is actually one form of self-propelled vehicle, there are quite a few other types at work in the agricultural industry today that are more commonly thought of as fulfilling the definition. Composed of a basic implement with a definite means of propulsion, they are specialized pieces of single or multiple-purpose equipment with such inherent advantages as mobility in the field or for transport, saving of labor, crop-saving features, and convenience of operation.

A well-known example of the single-purpose type is the self-propelled combine, which harvests a multitude of grain and seed crops. As a general rule, the engine and propulsion means in the self-propelled combine of today are considered as accessories to the combine proper. The same premise may be said to apply to the design of other similar units, such as self-propelled cotton and corn pickers, harvesters, and rice combines. The future, however, may well see more attention paid to the design and construction

Ross Series 81 Straddle Carrier, below, made by Clark Equipment Co., picks up a load of redwood lumber to transport it to the kiln for drying. It is powered by either a Hercules six-cylinder, 80-hp engine, or a Ford V-8 100-hp truck engine. In illustration at right, busily engaged in the harvesting of heavy oats, is the John Deere 45 self-propelled combine. Available with eight or 10-ft platform, it has a 40-bushel auger-unloading grain tank that empties in a little over a minute. Machine is powered by a four-cylinder, 42-hp Hercules JX4-C3 engine and weighs about 6100 lb.

Wisconsin engines. Above also is an A32 Series A Hy-Rail motor car with pickup body which travels on railroad or highway. It is powered by a Continental four-cylinder, 59-hp engine, and is widely used for inspection or maintenance service operations.

of the power and propulsion units to effect reductions in their weights, sizes, and costs.

The multi-purpose machine is relatively new to the agricultural field. The most familiar example of this type of equipment now on the market is a combine and/or a corn harvester. Other basic machines, such as the automatic hay baler, cotton, harvester, and beet harvester, may eventually be provided for use on a multi-purpose, self-propelled chassis. It is apparent, however, that considerable engineering work must be done to develop a single self-propelled chassis that will satisfy the requirements of such a variety of machines as those mentioned above.

Implements

The continually pressing problem in the years ahead of producing more food with less farm labor will require that all farm implements be designed to make optimum use of improvements incorporated in tractors. Tillage equipment, for example, will match the increased power in the tractor.

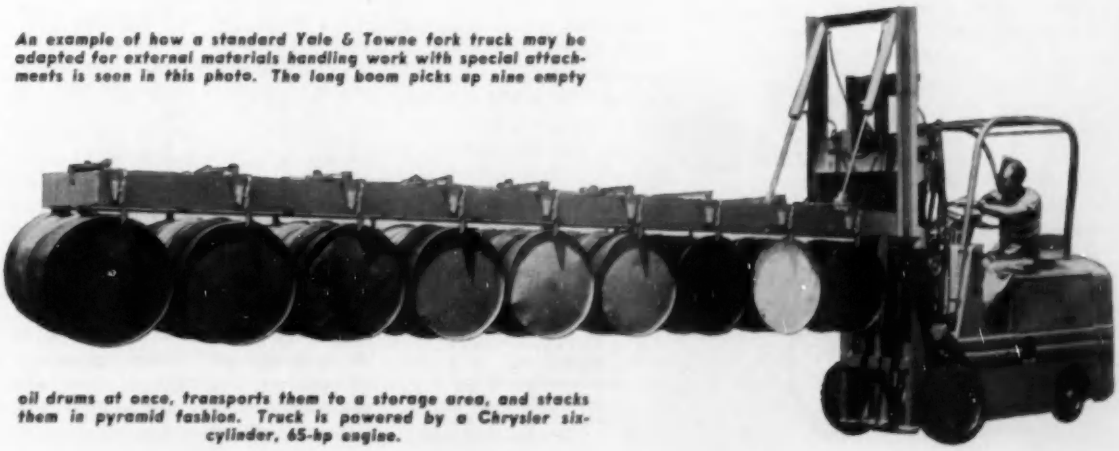
Mere increases in sizes of such equipment as plows will not, however, be the complete answer. Another big job will be to accommodate greater speed, and plow moldboards may have different shapes to avoid pitching the soil too far. Similar precepts, in accordance with the specific needs of the particular implements, will be applied to the future design of such other equipment as that used for planting, cultivating, fertilizing, insect and disease control, harvesting, and miscellaneous uses.

WOOD-USING INDUSTRIES

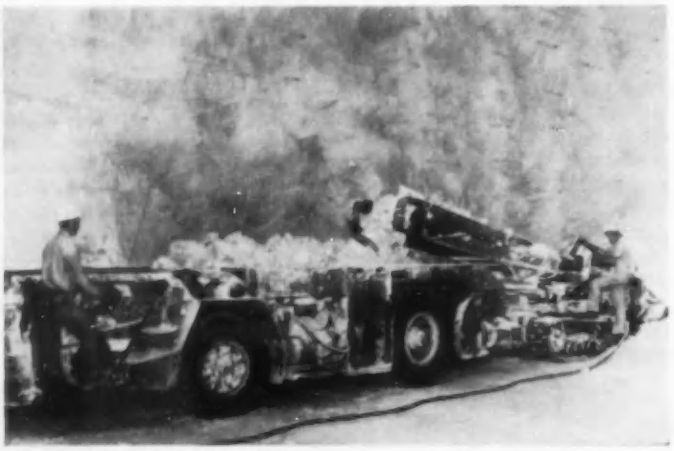
Mechanization in the wood-using industries—a term which includes logging, pulp, paper, plywood, and other fields which use wood as a raw material—has grown appreciably in recent years. Spurred on by such factors as rising labor costs, highly competitive conditions, and fewer establishments at greater distances, the trend toward mechanization is expected to continue.

The tendency in the wood-using industries today is definitely toward integration of mills to utilize all parts of the tree in the manufacture of a variety of products. As a result, automotive-type equipment finds increasing use in the various phases of logging operations—extraction of logs from the woods; transport to mills; handling in yards; and distribution of the end product. *(Continued on next page)*

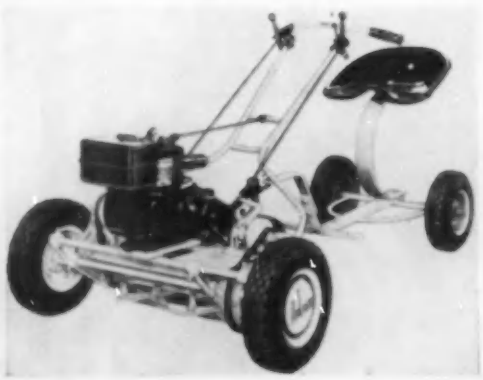
An example of how a standard Yale & Towne fork truck may be adapted for external materials handling work with special attachments is seen in this photo. The long boom picks up nine empty oil drums at once, transports them to a storage area, and stacks them in pyramid fashion. Truck is powered by a Chrysler six-cylinder, 65-hp engine.



Typical of the many kinds of ground equipment in use around air terminals is this LeRoi 105 Tractair shown towing a large plane. It is powered by a four-cylinder, 35-hp engine, in combination with a 125-cfm compressor to provide air power for applications where required.



Joy 60-E-12 Diesel Electric Shuttle Car is used for high-tonnage rock hauling on the surface or underground. GM-71 Model No. 3057C three-cylinder, 82-hp Diesel engine is directly connected to a 50 kw generator. Three 250-volt, d-c, 15-hp Reliance electric motors—two for traction and one for conveyor drive—are also employed.



Grass cutting becomes an easy chore with this 25 - in. Rolloway power lawn mower, equipped with riding sulky. Manufactured by Eclipse Lawn Mower Co., it is driven by a Briggs & Stratton four-stroke, 2.5-hp engine.

Tractors and Trucks

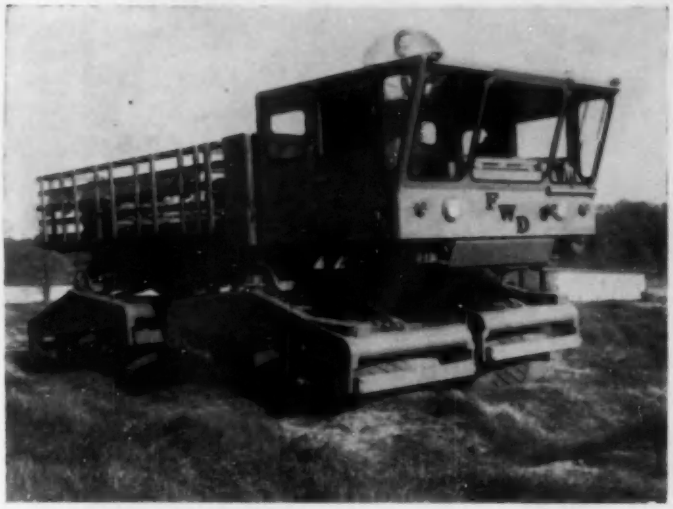
Aside from their widespread usage in the construction of logging roads and land clearing, tractors are employed extensively in the wood-using industries today for operational work. One of the activities in which tractors are most frequently engaged is that of ground skidding and pulling various devices for carrying logs, such as sulkies, sleds, bummers, arches, pans, etc. When occasion requires, a single or double drum winch is mounted on a tractor to log off areas which are not easily accessible, such as hillsides, gulches, and swamps.

In addition, tractors are extensively used for loading and handling logs. Equipped with a line and winch, boom, front-end loader, special fork, etc., they play an instrumental role in bringing the products of the forest to the consumer.

Often built specially to fit local conditions, the versatile tractor even serves as a carrier for felling and bucking saws with a mounted generator which supplies current through an attached cable; or, by the same token, a tractor may pull a donkey with steel towers for high-lead logging 40 to 60 ft above the ground. In short, the tractor with innate high capacity and its outstanding ability to function as a prime mover or carrier for a wide variety of specialized implements, is a key element in the productivity of the some 400 million acres of commercial woodland in the U. S. today.

First used for transportation in 1913 on an experimental basis in the Douglas fir region, the motor truck now plays a significant role in the wood-using industries. The development of modern highways and the public road system has enabled trucks to go directly to the logging operation and transport the logs to the mill, thus eliminating in many instances the old technique of river driving.

Then, too, many off-the-highway trucks of 15-ton or greater capacities that prohibit their use on public highways are used at logging sites for numerous haulage purposes. Oftentimes, for example, they are equipped with a winch to skid logs a short distance.



Huge new experimental Teracruzer cargo and personnel carrier is 12 ft wide, 25 ft long, and 10 ft high. Designed and built by Four Wheel Drive Auto Co., it uses new low-pressure, pneumatic tire "bags" developed and produced by Goodyear Tire & Rubber Co. The springless vehicle is classified at 40,000 lb GVW, has a load range of seven to 10 tons, and is powered by an eight-cylinder, 340-hp Continental gasoline engine.

Specialized Equipment

Increasing competition and a growing demand for certain wood products have prompted engineers to design new mechanical equipment of a specialized nature. For example, in 1953 the paper and pulp industry alone consumed 28.15 million cords of wood; without such valuable modern aids as the pulpwood loader, it is doubtful whether this demand could have been met so readily. Log carriers, loaders, and yarders, to name but a few, are other examples of specialized equipment currently at work in the wood-using industries.

RAILROADING

There are approximately 600 operating railroads in the U. S. today, all faced with a common complexity of problems — rising labor costs; higher material prices; increased taxes; more regulatory requirements; and frequently declining traffic returns. The net result has been an increasing demand for and use of mechanized equipment by the railroads throughout the past 25 years to cut operating costs.

The roadway and structures departments particularly have made growing use of automotive-type vehicles and machines to lower maintenance expenses, and the trend in this direction continues unabated. At the end of 1951, for example, U. S. railroads had a total investment of $12.9 million in roadway machines and heavy equipment.

The benefits of mechanization are exemplified by the fact that in 1923, 1926, and 1929, one billion manhours were expended in maintenance-of-way and structures on railroads. In 1951, on the other hand, only one-half billion manhours were used, although total gross ton mileage in 1951 was 60 per cent greater than the average of the three earlier years.

Off-Track Equipment

In recent years the use of automtive vehicles for the transportation of men and the hauling of tools and materials has increased considerably. Some of the larger railroads, particularly in densely populated areas, have large fleets of trucks and passenger cars in service. More than 50,000 motor cars, for example, were in use in 1947 for the transport of maintenance gangs, and highway motor trucks have enjoyed a similar popularity.

In some instances, railroads have modified passenger cars and trucks so that they can be operated both on and off the track for the transportation of men and materials to otherwise practically inaccessible points. A typical example is a standard passenger car that has been reworked by one railroad. Equipped with flanged pilot wheels that retract manually, it has two additional leaves in each spring. Heavier front coil springs, different pneumatic tire rims, and heavy-duty tires also aid in enabling it to operate on tracks when occasion requires. When the pilot wheels are in lowered position, the vehicle springs are locked and inoperative.

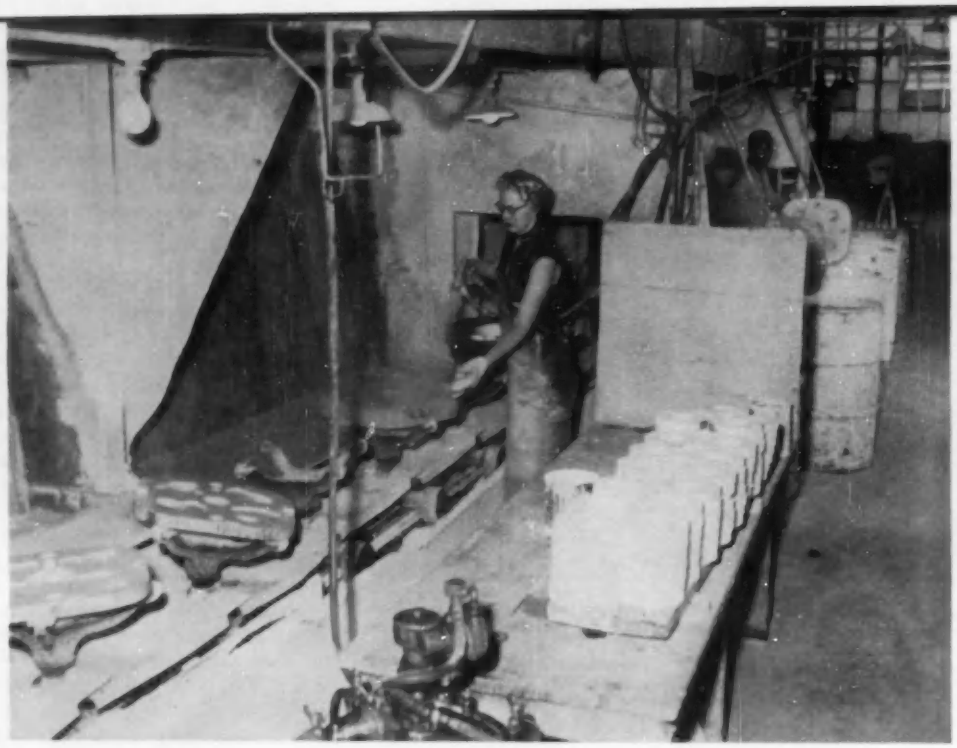
A large proportion of railroad expenditures for off-track equipment goes for construction machinery. As pointed out in the first section of this article, such machines as cranes, draglines, tractors, and a variety of grading and ditching equipment come into widespread use for railroad construction and materials handling operations. The important role which this type of equipment has played in railway economics is illustrated by the fact that four or five men today with a rail crane can lay more rail than 25 men can lay by hand.

On-Track Equipment

Until relatively recent years, most railroad track maintenance was a matter of men wielding picks, shovels, claw bars, and hammers. The former track gang of yester-year has, however, been whittled down in size by a host of specialized machines that do everything from lubricating switches to mowing weeds.

Power hammers on wheels drive spikes without sweat or strain. Huge ballast cleaners ride the rails under their own power, picking up the stone ballast, screening it clean and dropping it back in place. Following behind are tampers with stubby steel fingers that pack the clean ballast down tight to make a firm, smooth roadbed with good draining.

(Turn to page 114, please)



Individual slab cores are routed along this conveyor for application of the special wash coating. At this station it is applied by gun spraying.

Ausco Method for Casting PACKARD V-8 CRANKSHAFTS

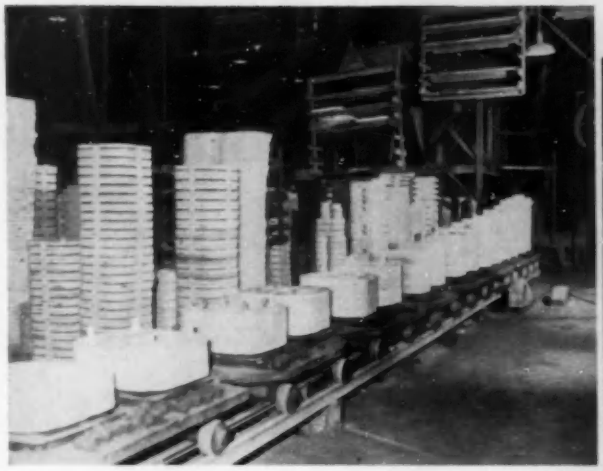
This is the Packard cast steel composition crankshaft ready for shipment from the foundry.

A FEW years back (see AI, March 1, 1951) we described some of the highlights of the Riverside Division foundry operation of Auto Specialties Mfg. Co. Long a specialist in the production of cast crankshafts, the foundry at that time was concentrating on the making of small crankshafts. Today the operation has been expanded to handle a much larger variety of such parts and is producing among other things, cast alloy steel crankshafts for Packard V-8 engines as well as Reo V-8's for trucks.

Apart from the Ford family of engines using cast crankshafts, Packard is the only other passenger car producer using a cast crankshaft in current production.

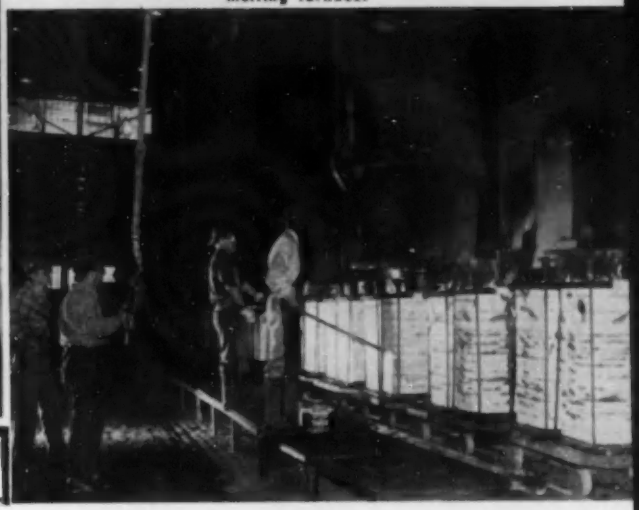
This crankshaft is made of electric furnace alloy steel, high in nickel-moly content, and produced under rigid metallurgical controls. The illustrations shown here are selected to give some of the highlights of the foundry operation.

Packard crankshafts are being made by slab core



Crankshaft molds are built up progressively along this line by adding slab cores as shown. During this assembly process the pin cores are installed where required.

The completed molds then are transported along the pouring line, seen here. Specification metal is poured directly from a 7½-ton ladle, fed from a nearby electric melting furnace.



molding, using an assembly of 20 slabs to a mold, producing four pieces at a time. One of the major advantages of the casting technique is the facility with which counterweights of any form and disposition can be located in the mold, assuring perfect alignment and requiring no cheeking in the machining cycle. In addition, the technique permits of coring all crankpins — using small pin core inserts.

Individual slab cores are prepared in the core room and after drying in the vertical core ovens are placed on the power conveyor, illustrated here, for filing and cleaning, then application of the special "wash" to protect the surface against burning. The wash is applied by hand on some areas, then sprayed over the entire core. This is followed by drying to bake the wash securely.

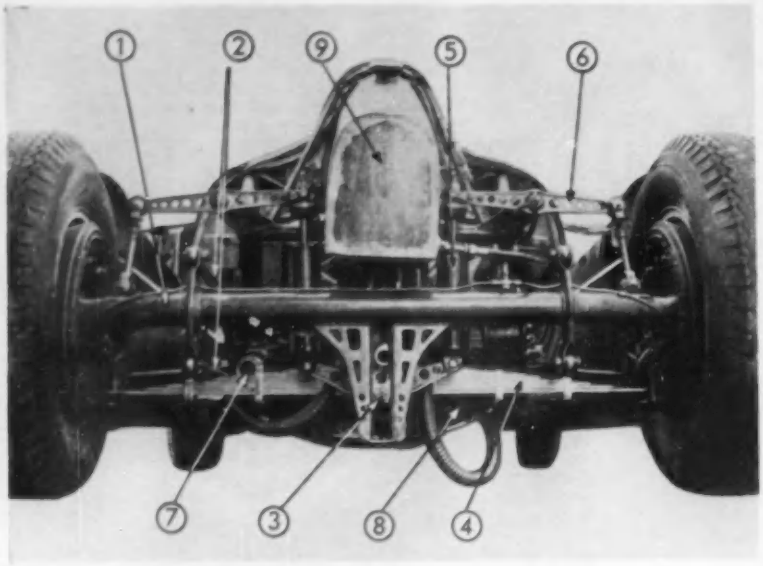
The stacked molds, after assembly, are transported to the pouring line where the special electric furnace composition is poured from a 7½-ton ladle.

After the castings have been removed from the mold and shaken out, they are ready for heat treatment. For this purpose Ausco has a battery of long tunnel type General Electric furnaces, the cycle for annealing and drawing being of eight-hour duration. The first stage is annealing. As the individual castings, handled 12 at a time, emerge from the annealing furnace, they are moved immediately to an adjacent H-P-M hydraulic press for straightening while hot. After straightening, the work is returned to the

Ausco cast crankshafts are hot straightened in this large H-P-M hydraulic press. The draw furnace, mentioned in the text, is in the background in the center, the annealing section being directly to the right out of this view. Crankshafts, emerging from the annealing furnace, enter the conveyor section at the right and are moved directly to the press.

conveyor connecting the two furnace sections and is ready to proceed through the draw furnace for completion of the heat treating cycle.

Final operations include grinding and shot blasting. In the rough, Packard crankshafts weigh about 68 lb on the average. (*Turn to page* 174, *please*)



Unorthodox rear suspension of Lancia Grand Prix car. Picture shows De Dion rear axle tube (1), twin radius rods (2), sliding trunnion (3), spring (4), centrally mounted telescopic shock absorbers (5), levers actuating shock absorbers (6), starter coupling (7), transmission housing (8), oil tank (9). Photograph by Mallander.

DESIGN FEATURES *of the*

THE formula 1 (2½ litre piston displacement) competition car recently brought out by Lancia & Co. of Turin, Italy, features light weight construction. European racing engine designers consider that a figure of 1.7 to 1.9 hp per cu in. ratio is the maximum attainable at present with unsupercharged engines and alcohol fuels. Since the power output of modern competition engines does not vary much, reduction of weight is an important feature of the latest designs and of the Lancia in particular. A chassis frame consisting of tubular elements is used, with the engine forming part of it. The engine is rigidly connected to the frame structure and thus eliminates a number of tubes.

The V-8, 90 deg engine with 2.99 in. bore and 2.70 in. stroke has a piston displacement of 152 cu in. The compression ratio is not disclosed, but maximum horsepower is given as 250 at between 8000 and 8500 rpm. Each block has two Solex two-throat carburetors.

The four overhead camshafts are driven by multiple chains, and hairpin type springs are used for the large-diameter valves. Pistons have four top and one bottom ring and are heavily ribbed inside. The piston top forms a steep dome and has semi-circular valve cut-outs on both sides. Twin ignition is used and the spark plugs (not shown in the sectional drawing) are mounted between the valves on top of the cylinder head, slightly offset longitudinally. Water jackets are very generous, and it is expected that a higher power output can be attained without thermal difficulties. A number of engine design details are not yet disclosed.

Two lateral fuel tanks carried separately from the main body. These reduce weight distribution change with full and empty tanks. The lateral fuel tanks have permitted a very low build of the car with a correspondingly decreased frontal area and low drag figure despite the fact that the wheels are not faired in at all.

The engine and transmission shaft are slightly offset and arranged at an angle, allowing for the driver's seat to be placed low. A bevel pinion and gear, which are easily interchangeable when the final drive ratio is to be altered, transmit torque from the two-piece propeller shaft to the transmission unit. This is placed at the rear and consists of a multi-plate clutch, a five speed synchronized gear box and the rear axle drive unit, all arranged transversely.

In the chassis frame, as much use as possible is made of light, welded thin gage tubes of high tensile strength. The front suspension consists of two transverse triangular links made of welded tubes. They are carried by ball joints in the brake plate without an additional king pin. The lower anchoring point is specially strengthened. The light transverse leaf

Sales Contests Pushed By Automobile Concerns

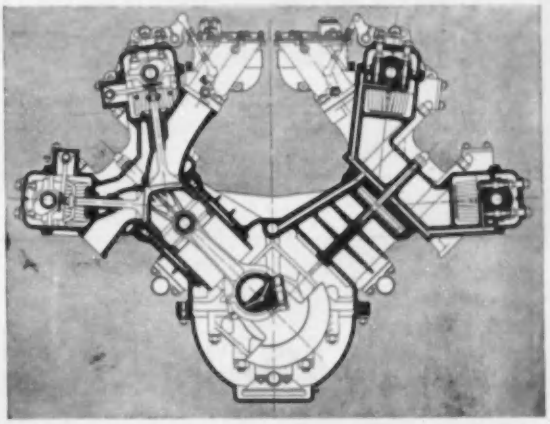
Automobile companies are pouring out millions of dollars this year on sales contests for dealers, theor salesmen, and the public to spur new car sales. Practically every company has had some sort of contest going since the start of spring, and several have launched additional ones to spark sales during the summer. In addition to factory-sponsored campaigns, many dealers throughout the country are figuring out their own ways to lure traffic into their showrooms.

Only a few of the car companies feel there is no need for special promotion programs, and most of them offer attractive prizes which range

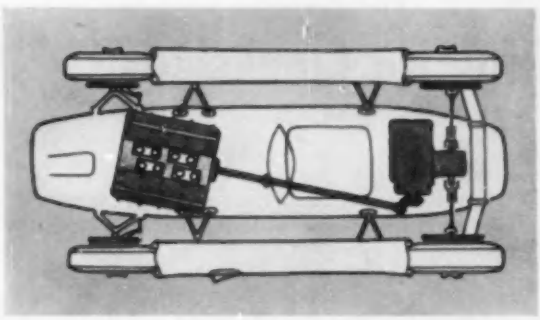
Lateral fuel tanks give characteristic appearance to Lancia Grand Prix car

By Robert Braunschweig

Lancia V-8 Competition Car



Above—Section of V-8 engine shows slender cylinder block with cooling ribs. Wet cylinder liners are positioned by radial fins. Exhaust valve guide also is ribbed. Intermediate levers in valve train will be discarded in later versions. Drawing courtesy of Automobil Revue, Bern



Sketch at left shows general arrangement of Lancia car. Engine and transmission shaft are arranged at an angle allowing for lowering of driver's seat. Multi-plate clutch and five speed transmission are mounted integrally with rear axle drive at rear end.

spring is carried in a fixed bearing in its center, but its outer ends slide in pockets formed by the lower transverse link, the spring itself being thus relieved of lateral forces. Both at front and at rear twin levers with a pivot in the middle are used for actuating the shock absorbers. A De Dion rear axle is employed.

Wheelbase is 90.55 in., front and rear treads are 49.2 in. Weight of the car is 1350 lb; and 53 gallons of fuel can be carried in the two tanks.

from merchandise to trips to Mexico, Bermuda, and Hawaii. Although in most cases car companies share the cost for a prize with a dealer, one car company is footing the complete bill for awards it is giving to top salesmen.

Biggest pitch seems to be toward salesmen, although dealers themselves and the public are given a chance to cash in on the bounties. Contests designed chiefly for salesmen generally consist of a variation of "point" systems, under which a salesman can win any number of prizes based on the number of stamps, or points, he collects for selling new cars. In contests designed for just the dealer, the dealer usually has to exceed a certain quota of car sales to receive a prize.

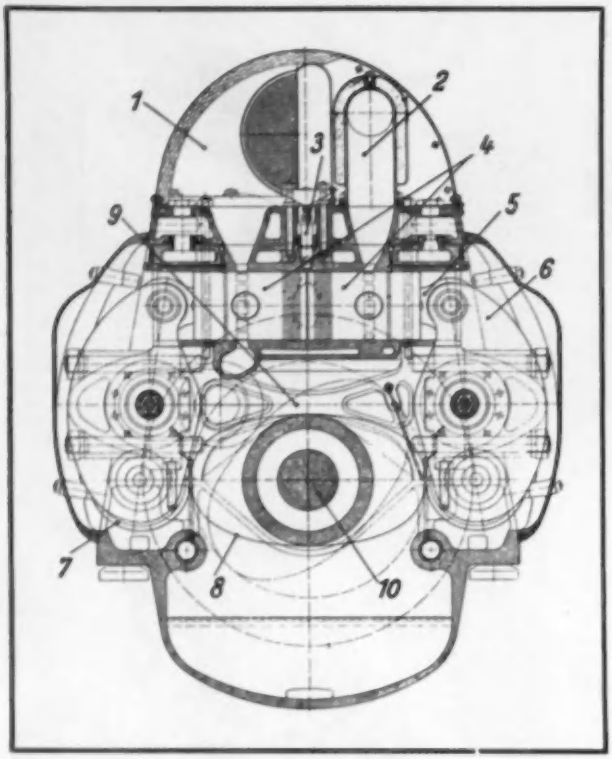


Fig. 1—Transverse section of the engine

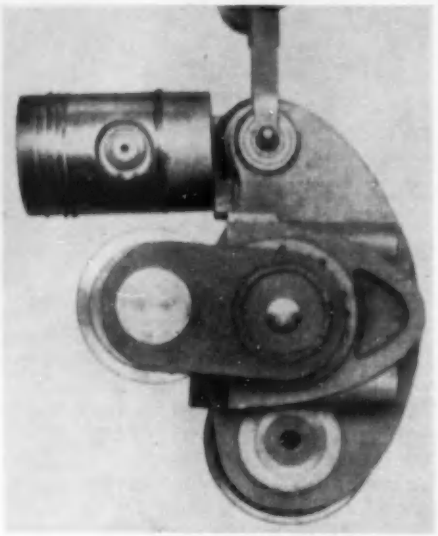


Fig. 2—Piston and rocker assembly

Illustrations courtesy of *Motortechnische Zeitschrift*

By P. M. Heldt

Two-Stroke Diesel Has No Crankshaft

A TWO-STROKE, double-piston Diesel engine which requires no crankshaft has been developed by the Svanemolle Wharf Co. of Copenhagen, Denmark, for marine and stationary applications. Instead of a crankshaft, it makes use of a camshaft or an eccentric shaft, which not only serves to convert the reciprocating motion of the pistons into rotary motion, but reduces the speed of rotation in the proportion of 2 to 1, so that the output shaft makes only one revolution to two complete cycles in each cylinder. This makes it practical to drive a propeller directly from the engine. Somewhat similar engines equipped with a crankshaft are being produced by Junkers and Sulzer in Europe and at one time were produced by Hill in this country. An advantage claimed for the construction is that it gives a very compact engine of low output speed which, moreover, is free from torsional vibration. The problem of the maximum permissible load between cam and roller was solved by tests carried out by Prof. Niemann.

The three-cylinder engine has a bore of 150 mm. (nearly 6 in.) and a stroke of 2 x 150 mm. At 350 rpm of the eccentric shaft it develops 150 bhp, which corresponds to a bmep of 87 psi. The cams or eccentrics are machined from an alloy steel similar to that used for ball-bearing races and are hardened to 63 Rockwell C. These cams, together with cylindrical spacers, are assembled on and held together by a central "through" shaft with a flange at its rear end to which the flywheel is bolted. Each cylinder (right and left) is a single casting which is bolted to cast-steel cross members. These members take the load on the bearings of the rocker levers in such a way that the cast-iron parts are relieved of stress. The engine can be built with any number of cylinders by simply adding units, each comprising a cylinder, a cast-steel cross member, and a set of cams and rocker levers.

Figure 1 shows both a longitudinal and a cross section of the three-cylinder engine, 1 being the suction (air) chamber, 2 the exhaust, 3 the injection nozzle, 4 the piston, 5 the connecting rod, 6 the rocker lever, 7 the rocker-lever roller, 8 the cam or eccentric, 9 the cross member, 10 the center stud holding the cams together, and 11 an oil-pressure piston by means of which the pitch of the propeller is controlled. Details of the piston, rocker lever, rocker-lever roller, etc., are shown in Fig. 2.

(*Turn to page* 150, *please*)

Miller

HIGH PRESSURE HYDRAULIC CYLINDERS

Provide Desired Thrusts Up To 160 Tons Plus!

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

Immediate Delivery on Large Selection

Most complete quality line ever offered for 2000-3000 psi heavy duty service. Bores up through 12", strokes up to 22 feet, 19 standard mounting styles. Millions of maintenance-free strokes per cylinder *proven.* Available in single and double rod end, cushioned and non-cushioned, over-size rod, and "high temperature" service cylinders.

Over 2,000 selections—covering 17 popular mounting styles in 1½" through 5" bores and 1" through 36" strokes—now available for **immediate shipment.** Miller Air Cylinders also in stock for immediate shipment.

Write For Catalog and Stock List

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

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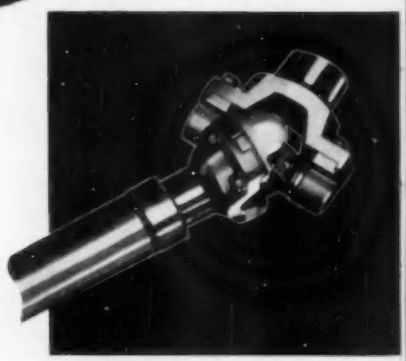
AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Mountains Moved ...Money Saved

International Truck, Model RF-174



Universal joints really get a workout in the "off highway" heavy construction field. Nothing's rougher than transmitting torque while moving mountains of material over washboard roads.

The problem is to build ruggedness and strength into the universal joints without excess weight.

That's why Borg-Warner engineers at B-W's Mechanics Universal Joint Division eliminated 28 pounds of dead weight . . . made their universal-shaft assemblies 34% lighter . . . without sacrificing quality, accurate balance or smooth operation. And that's why these Mechanics precision-fitted, roller bearing joints "keep 'em rolling" with little likelihood of expensive, work-stopping repairs.

Highway carriers benefit too. Lighter B-W engineered universal joints provide up to 5,600 extra ton-miles of payload during the average life of a heavy-duty truck.

This substantial saving is another direct result of Borg-Warner's tradition: "Design It Better—Make It Better" . . . an active policy serving the automotive industry every day with scores of precision parts.

ENGINEERING MAKES IT WORK

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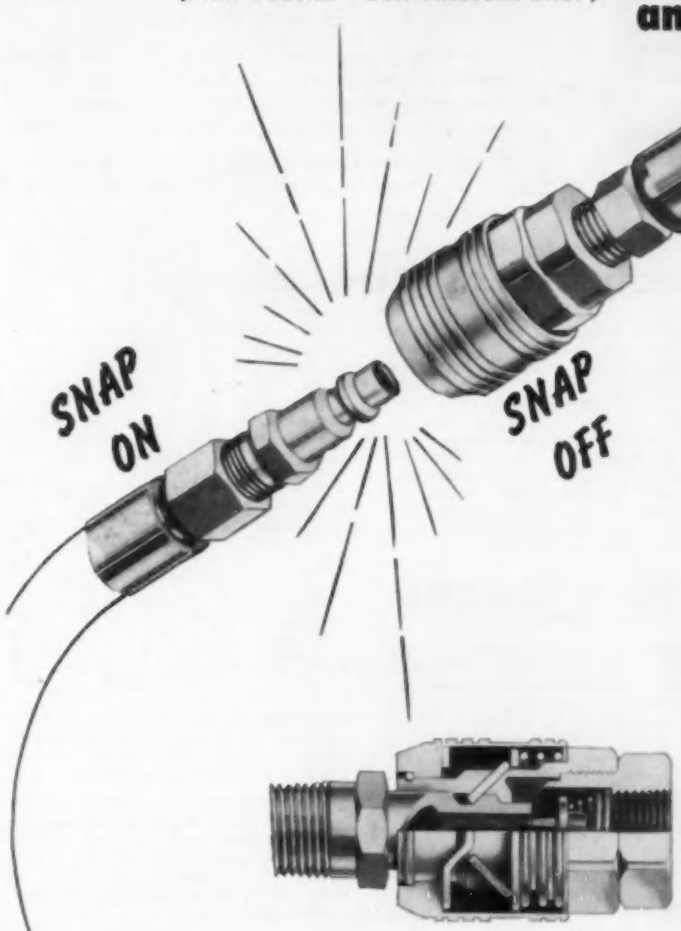
NEW "HI-LO" SPEED COUPLERS and CONNECTORS

(HIGH VOLUME—LOW PRESSURE DROP)



"HI-LO" for *highest* air volume, *lowest* pressure drop

Better efficiency, lower operating costs for all air-operated devices.

Easy to use—snap on and off.

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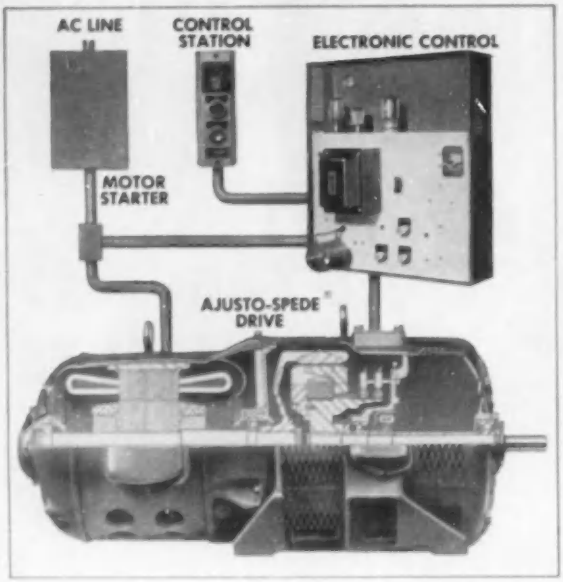


DYNAMATIC®

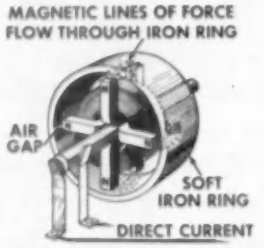
How it Works — What it Does — Why it's Better

Increased production, reduced costs, improved quality of product, and more complex processing techniques demand an ever increasing use of stepless adjustable speed drives. Dynamatic eddy-current equipment in one form or another attains these objectives.

Dynamatic Ajusto-Spede® Drives, Air and Liquid Cooled Couplings, Air and Liquid Cooled Brakes, Absorption, Motoring, and Universal Dynamometers operate on the same basic electro-magnetic principle.

A typical installation pictorially illustrates the simplicity and minimum components required to obtain controlled adjustable speed.

Basic Principles of Operation



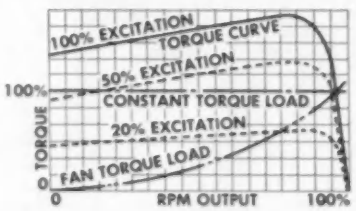
The transmitting of torque by Dynamatic eddy-current devices is based upon a simple magnetic principle easily demonstrated by the physics experiment, using a horseshoe magnet, iron filings, and a piece of cardboard. If several unmagnetized soft iron bars in the shape of a U, illustrated in the above drawing, are inserted in an insulated coil of wire, the bars will become magnets when direct current flows through the coil. Strength of the magnetic field is determined by the current flowing and the number of turns in the coil. By adding a solid ring of soft iron, encircling the poles of the electromagnets, the magnetic lines of force will flow through the ring. The basic construction of all Dynamatic eddy-current rotating equipment is then simulated.

The illustration shows magnetic lines of force with no relative rotation between the ring and magnets. When the field assembly (magnets and coil) is rotated mechanically, the iron ring separated from it by a nominal air gap remains stationary until current is applied to the coil. With the coil energized, mechanical rotation of the magnets produces movement of magnetic flux in the ring, creating eddy-currents in the ring. These induced currents develop a second magnetic field. Its strength is determined by the strength of the primary field and the relative speed difference (slip) between the two members. In the eddy-current coupling, attraction of these two fields cause the ring to follow the field magnets in rotation. When the coil current is varied, the eddy-currents will be proportionately affected, and torque produced at the output shaft will be similarly changed.

A typical eddy-current coupling torque curve with rated excitation and additional curves with reduced excitation is shown. In the same figure, a constant torque and fan torque load curve is plotted. Excess torque, which is a measure of accelerating capacity, is indicated. The Dynamatic coupling transmits this torque from a driving member, that may be either the drum ring or field magnets, to a driven member without mechanical contact.

Because of the extremely small excitation requirements, Dynamatic units lend themselves readily to electronic or magnetic amplifier control.

By taking advantage of the very high amplification factor of these controls, the largest couplings can be easily and conveniently controlled with a small adjusting potentiometer. The voltage output of a permanent magnet alternator mounted on the coupling output shaft varies directly with the shaft speed. This variable voltage signal modulates the control, automatically maintaining the selected speed of the coupling output shaft, within close limits, over a wide speed range.



Other features are easily incorporated—constant tension, controlled acceleration, threading, jogging or inching, torque limit, speed matching, and many others.

The relative simplicity, smoothness of operation, accuracy, ease of control and low maintenance of Dynamatic eddy-current equipment are factors meriting serious consideration of this type of equipment on almost all adjustable speed applications.

A free copy of the Dynamatic General Bulletin describing eddy-current equipment in more detail is available. Write for your copy.

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DIVISION • EATON MANUFACTURING COMPANY

3300 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

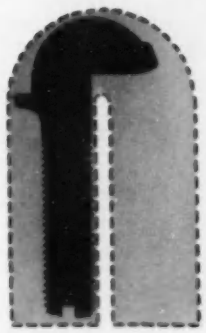
Eight operations cut to four

The old way:

The stud shown here was used by a tank manufacturer to blind feed into a tubing hole during assembly. Multiple diameters were required to hold the stud tight after insertion. To achieve this rather intricate shape, eight operations were originally required . . . until National was asked to study the problem.

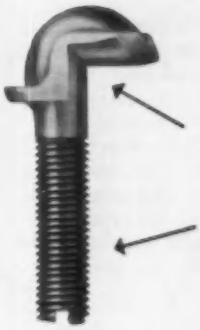
The National way:

Our "Special Products Service" showed this manufacturer how the stud could be produced to specifications *in only four operations* by cold-heading. Because National had the wide range of cold-heading equipment and specialized know-how needed to do the job, production costs were cut 50% . . . and substantial material savings resulted because cold-heading leaves a minimum of scrap.



OLD WAY

Bar stock bent in U-shape was machined to specifications in eight operations, with considerable waste of metal.



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Head was upset into shape needed with multiple diameters.

Only four operations needed to complete stud by cold-heading and roll threading.

Bring your "Special" problems to National

Can we help you realize the same type of economy on *your* special fastener needs? Our "Special Products" representative will be glad to study your specifications. Write for free copy of National's "Special" fastener booklet.

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Farval reduces lube time 80% on world's largest horizontal forging press at Tube Turns

FARVAL—
Studies in Centralized Lubrication
No. 174

NOT a bearing failure or a shutdown due to faulty lubrication in the year since this world's largest upsetter was put into service! That's because it was equipped with a Farval Centralized Lubrication System by the builder.

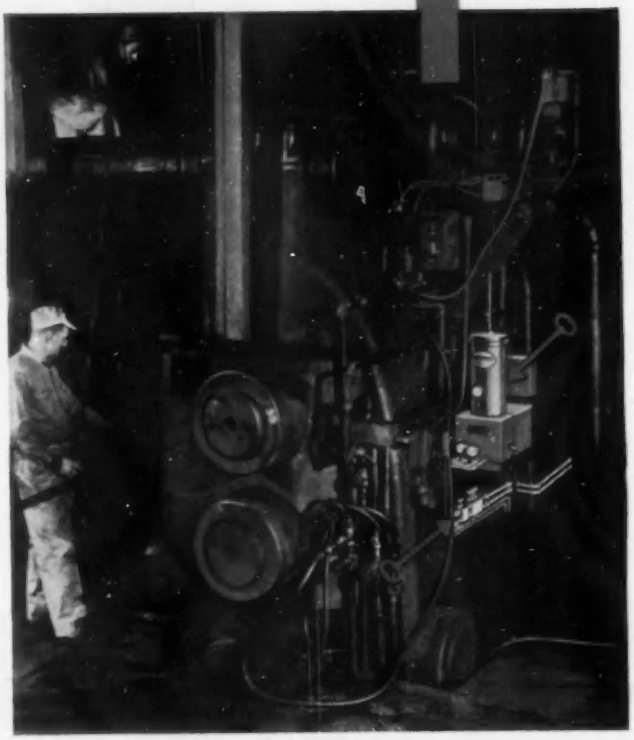
Farval was installed because of Tube Turns' previous good experience with systems on five other upsetters and two presses. They found that the number of man hours required for lubrication was reduced approximately 80%. Even more important is the freedom from work stoppages and bearing troubles assured by Farval. The Supervisor of Maintenance says, "When other machines of this type are secured, they too will be equipped with Farval Systems."

Farval is the Dualine system of centralized lubrication. It delivers clean oil or grease, exactly metered, to each bearing as often as desired, pumped under pressure. To lubricate a machine like this one, with 110 bearings, requires no labor and no downtime; it is done automatically and at regular intervals, while the machine is under full load.

It will pay you, too, to investigate Farval. Let us send a representative to discuss economical, efficient lubrication with you. Write for our Bulletin 26, which illustrates and describes the Farval line.

The Farval Corporation, 3296 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



10-inch horizontal upsetter in operation at Tube Turns Inc., Louisville, Ky. It forges components for military and commercial aircraft of advanced design. Note the Farval automatic pumping station on the right.

KEYS TO ADEQUATE LUBRICATION—Wherever you see the sign of Farval—the familiar central pumping station, dual lubricant lines and valve manifolds—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Latest Developments in Automatic Operations, Controls, and Machining Accuracy To Be Among Outstanding Features of NMTBA Show in Chicago Next September

Features of Machine Tool Show

According to Tell Berna, general manager of the National Machine Tool Builders' Association, there will be a large number of transfer machines and more big presses at the NMTBA show in Chicago, September 6 to 17, this year, than in 1947. Another striking feature, reports Mr. Berna, will be the progress made in recent years in the development of automatic operations, controls and machining accuracy. He states, "We are entering upon a period in which men will talk of millionths of an inch as casually as of thousands—with not only machining skills but actual rate of productivity built into the machines themselves."

U. S. Government listings show that there are 441 distinct types of machine tools—practically all of these will be on display at the September show. Furthermore, the machines will be in operation.

If metalworking plants are not interested in making money in the years to come, then there is no sense in having their machine tool buyers and production executives at the "World's Best Investment in Action." We believe that the Micromatic Hone Corp. slogan—"The man who needs a new machine and doesn't buy it is paying for it anyway"—is most applicable.

In talking to executives throughout the automotive industries we have found that the progressive companies will have many people at the exhibition—not just for the sake of window-shopping. Many are planning to prepare full scale reports on what they see and just how the equipment can help them improve their industrial position.

As William E. Rutz, chairman of the Show Committee and executive vice-president of Giddings & Lewis Machine Tool Co., points out, "Not in years have executives concerned with problems of cost reduction had such an opportunity to study ways and means of cutting cost per piece produced as that offered by the two (Machine Tool and Production Engineering) shows."

Something else has been added for the shows which is a world first—there will be a scheduled helicopter passenger service between the NMTBA Show at the Amphitheater and the Production Engineering Show at Navy Pier. More than 100,000 people are expected to view the shows during the period from September 6 to 17.

Now—A Machinability Computer

GE's Carboloy Department has developed a 32 lb portable analog computer which is capable of calculating some 14 operational variables in machining. Answers provided by the computer are based on the use of those feeds, depths of cut, proper grades of carbide and tool geometry which will result in a normal wear type cutting edge failure.

The computer was developed by Dr. W. W. Gilbert, formerly with University of Michigan, now with GE's manufacturing services division. Carboloy engineers provided the necessary carbide tool information needed for the computers' operation. It will be sold for about $500 by Carboloy and will be available after September 1.

Replacement Programs

The Rockford, Ill., machine tool builders have put out an excellent booklet on machinery replacement programs. It contains the programs of several manufacturers which are constantly alert to the economies of machine replacement.

Around the Industry

Mechaneers Inc., Bridgeport, Conn., has announced a financing method for its tools, dies, molds, jigs, and fixtures. The plan, copyrighted 'Toolinglease,' can be negotiated with or without purchase options.

(*Turn to page* 180, *please*)

THE GREATEST SHOW ON EARTH
MACHINE TOOLS
the world's BEST INVESTMENT in ACTION
Who decides MACHINE TOOL PURCHASES?
56% MACHINE TOOLS AND METAL FORMING EQUIPMENT
MACHINE TOOL USERS to increase CAPACITY 25% 1960

National Machine Tool Builders' Association Show Committee: Back row: James C. Herbert, Jones & Lamson Machine Co.; Donald H. McIver, Ex-Cell-O Corporation; Frank Moran, The Carlton Machine Tool Co.; Stanley A. Brandenburg, The Monarch Machine Tool Co.; Burnell A. Gustafson, Sundstrand Machine Tool Co. Front row: W. E. Rutz, Giddings &Lewis Machine Tool Co.; M. A. Hellesgreen, Landis Tool Co.; Frank U. Hayes, The Bullard Co. Missing: E. P. Cunningham Clearing Machine Co.; Tell Berna, General Manager, NMTBA.

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

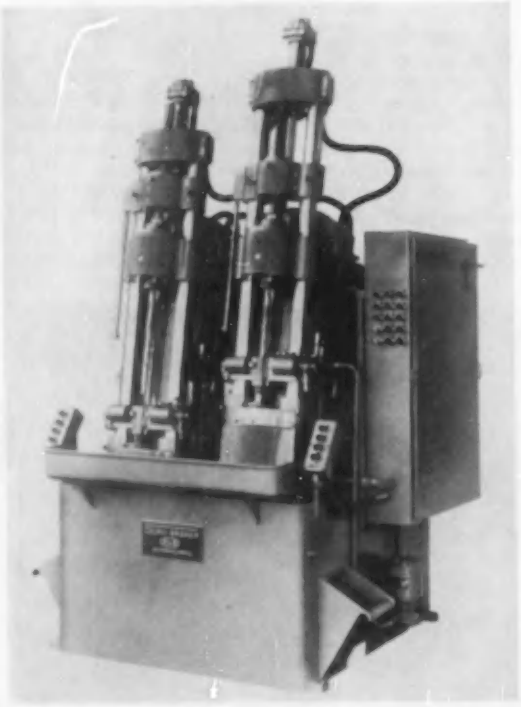
Broach for Threading Large Nuts

THE Scru-Broach is a production machine for threading operations in large nuts, especially those having fast leads, such as lead nuts and nuts for circulating ball type screw assemblies.

The machine is designed to work with a special type of broaching tool that has the appearance of a tap, but the cutting action of a broach. This tool is easily sharpened by grinding the faces of the teeth in the flutes. The teeth are not form-relieved, and therefore can be sharpened repeatedly without changing the size or form.

The Scru-Broach is built with one, two or four work columns. A hydraulic system provides pressure for clamping the work, actuating the tailstocks and positioning the fixtures. A motorized pump supplies coolant. The broach is rotated and fed through the work by means of a lead screw powered by a motor mounted on the rear of the column. The pitch of the lead screw corresponds with the pitch of the thread being cut. *Ex-Cell-O Corp.*

Circle 46 on postcard for more data



The Scru-Broach is being used to cut ball race threads in nuts for steering gears.

Single-Point Presses

TWIN geared Steelweld single-point presses of the straight-side tie-rod type, which are mechanically powered, are of the welded steel construction and incorporate the latest advances in design for safety and dependability. These include a low inertia air-operated clutch and brake unit; barrel-type adjustment; non-metallic, non-scoring guides; automatic lubrication. Air cushions are designed with the cylinder opening downward to prevent foreign materials from working in.

Sizes developed range from 150 to 500 tons and have bolster areas of 30 by 36 in. to 42 by 48 in. Operating speeds are from 10 to 20 strokes per minute. Presses with other specifications will be engineered to suit specific requirements. *Cleveland Crane & Engineering Co.*

Circle 47 on postcard for more data

Newly Perfected Single-Acting Air Clamp Cylinders

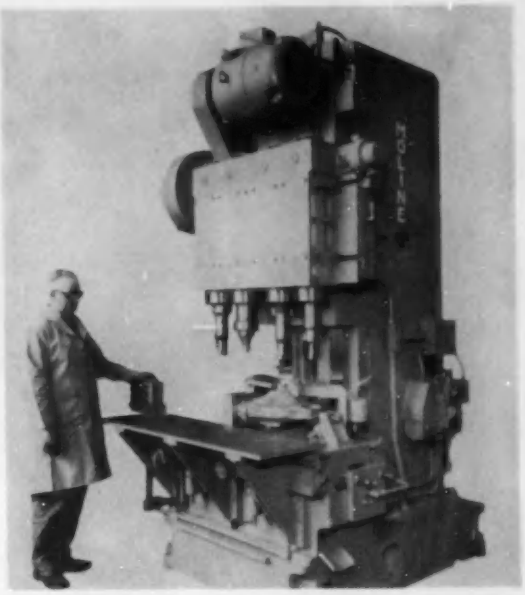
TWENTY-SIX newly perfected single-acting air cylinder models are now in stock. Increased bearing surfaces without lengthening the cylinders makes the ram steadier. New larger diameter return springs, Oilite ram bearings, machined surfaces where required, use of full floating Hycar synthetic rubber piston cups are other features. *Mead Specialties Co.*

Circle 48 on postcard for more data

Boring Machine Tooled for Housing

A SPECIAL fixture and appropriate tooling is used to adapt a No. 115CB hydraulic rail feed boring machine to rough and finish bore, counterbore, face and chamfer two holes in a drive housing used on combine harvesters. The machine is equipped with four anti-friction bearing spindle heads to which are attached flange mounted boring bars. Hardened and ground steel double V-guide ways are used on the machine column and hardened and ground steel wear plates on the slide.

The fixture is a two-station power-shifting type in which the drive housing is loaded, locating on previously milled surfaces. Hand operated clamping screws are provided to hold the work piece securely in place. A separate, adjustable pressure hydraulic pump, independent of the hydraulic feed pump for the machine cycle, is used to shift the fixture from the roughing to the finish boring position. The hydraulic pressure remains on the shifting cylinder to hold the fixture firmly against positive end stops during each boring operation. Locating plungers are provided for the fixture location in each of the two working positions.—*Moline Tool Co.*



Moline boring machine, usually for boring engine blocks or cylinder liners, shown tooled for a drive housing.

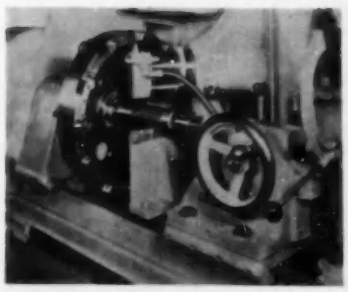
Circle 49 on postcard for more data

Special Grinder

INTERNAL helical teeth on a ring gear about 18 in. in diameter and only ½-in. thick can be ground on a special machine recently announced. Basically a Red Ring model SGF-18-in. external helical gear tooth grinder, it is modified with the wheel spindle swung to an angular setting corresponding to the helix angle of the gear.

The top surface of the wheel contacts the work. Table travel is limited so that the gear does not contact the motorized grinding wheel spindle. A special upsidedown grinding wheel dresser attachment is mounted on the machine table to dress the top surface of the grinding wheel. Templates are provided for dressing each side of the wheel individually. *National Broach & Machine Co.*

Circle 50 on postcard for more data



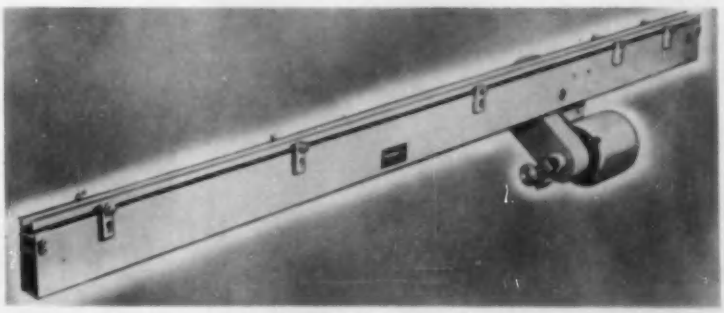
Closeup of the gear mounted in grinding position.

Panelboards

A NEW line of quick-make and quick-break plug-in fusible distribution panelboards is being marketed as the QMB Saflex. Plug-in components include both main and branch circuits as large as 200 amp, either 250 or 600 v. They are equipped with rugged plug-in stabs and are easily plugged onto round bus bars. The larger 400 and 600 ampere units are bolted to flat bus bars and are available in factory assembled panels. The units and solid neutral may be added, interchanged or removed. All units are dual horsepower rated for standard and time delay fuses. They also have a safety interlock incorporated in the cover. Branch units are individually enclosed and have front operating handles of cast aluminum. *Square D Company.*

Circle 51 on postcard for more data

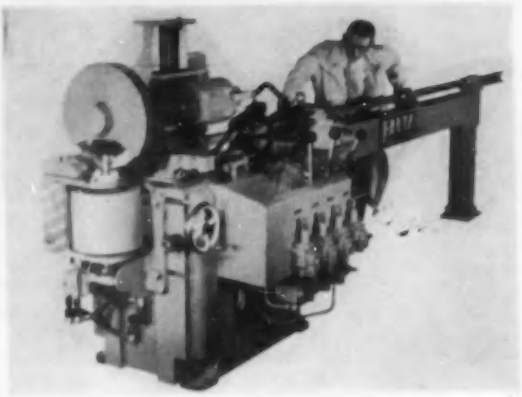
Conveyor for Small Parts



Transfer conveyor model 1600 B has a frame only 1¾ in. wide yet has capacity for parts from ¼ to 1½ in. in diameter. Power is furnished by a ¼-hp three-phase motor. Sizes will meet individual specifications. (Feedall, Inc.)

Circle 53 on postcard for more data

NEW EQUIPMENT PLANT • PRODUCTION



Four complete bends are made on a Hautau machine in four seconds. New tubes must be loaded on the support rods every four minutes.

Makes Tube Connectors

A MACHINE which produces copper tubing return connectors at the rate of 3600 per hour bends short U-shapes at the tube ends and cuts them off from the remaining tube lengths. The machine can produce a wide variety of bent tubing shapes with only minor tooling changes. The hydraulic actuation may be either manually controlled or automatically cycled.

Four lengths of tubing at a time are slipped over circular rod supports which are incorporated in the machine. The cycle begins when a cylinder actuated clamp grips one end of each of the four tubes and a second cylinder feeds the tubes over a male die half. A hydraulic motor then rotates a female die through 180 deg around the male half, forming the four U-bends. A circular saw then lowers on a vertical slide cutting the four bends off from the remaining lengths of tubing. The bends are removed from the male die half by a spring pressured clamp which is carried on the end of a pivoting arm that is actuated by a hydraulic cylinder. The saw and the female die half are then returned to starting positions. *Hautau Engineering Co.*

Circle 53 on postcard for more data

Removable Guide Pin

EASY variable adjustment to the shut height of the die is the feature of a removable guide pin known as the Spira-Lock. The pin is designed with a special threaded end to fit a threaded bushing. Adjustment is obtained by screwing the pin into the bushing to the desired height. With the pin at the proper height, it is pressed or driven down until the thread of the pin is press fit into the bushing thread.

Removal of the pin is accomplished by releasing the lock nut, driving the pin down until the threads are once more in line, and unscrewing the pin. Removal is possible in the press without the necessity of turning over the die shoe.

Many other features and advantages are claimed for the adjustable height pin. Both pin and bushings are made of hardened steel for long life, with a negative clearance of 0.0005 in. between the two components. Maximum rigidity is assured by utilizing the entire bearing surface of the bushing. *Superior Steel Products Corp.*

Circle 54 on postcard for more data

Job-Lot Finishing Machine

DEVELOPMENT of a semi-automatic mechanical finishing machine for handling small-lot production parts in a relatively short time cycle is announced. A removable tub in which finishing mass is contained and rotated allows use of several tubs with different type masses. Each tub has a built-in sludge removal system. The variable-speed drive is a separate unit on which the tub is mounted. The tub is 44 in. in diameter with a working depth of 13 in.

In operation, the parts are held in fixtures attached to lower ends of four vertically mounted spindles, which are mounted above the mass. Spindles lower to submerge parts in the rotating processing mass. As the spindle submerges the part into the mass, it rotates, thus all sides of the part are exposed to the mass to insure uniform finishing. Three different spindle arrangements are offered. Spindles are complete with manual flushing, and manual controlled air-operated fixture locking and unlocking. Rotation of the spindles stops automatically when spindles are raised from the mass. *Roto-Finish Co.*

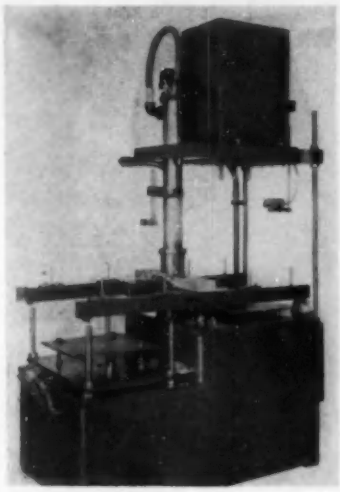
Circle 55 on postcard for more data

Four - spindle mechanical finishing machine for small-lot or experimental work.

Shell Machine

TWO-STATION operation is provided in the Blo-Core shell machine for patterns up to 15 by 20 by 14 in. draw. Resin coated sand is blown at low pressure into heated core boxes or die cavities. Curing takes 30 seconds or less.

All operations are initiated by solenoid valves. Heater plate temperatures are thermostatically controlled. No drier plates or ovens are needed



Mechanical semi-automatic shell mold machine.

to make cores, which may be made hollow. So-called contoured shell molds are made which allow cope and drag impressions on one mold. Back-up materials are not required. Either vertical or horizontal partings can be used. *C & S Products Co.*

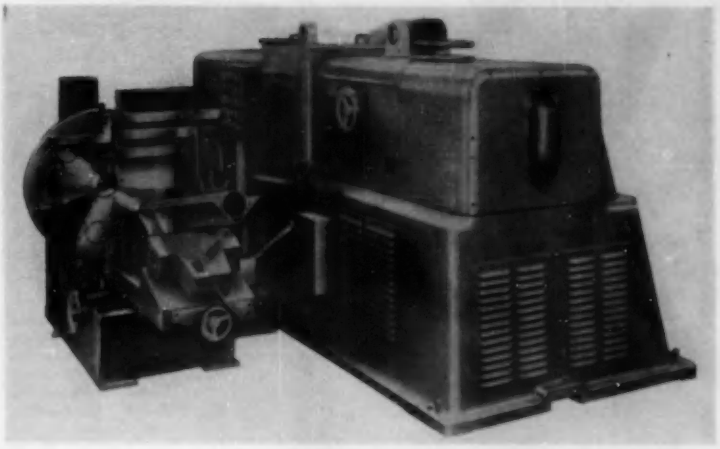
Circle 56 on postcard for more data

Air Vise

GRIPPING with a force 15 times air line pressure, the four in. jaw of the model 44 air vise is indefinitely adjustable to a maximum opening of 4½ in., with maximum travel of ⅝ in. Maximum operating pressure is 150 psi. An air regulator is available as an accessory. The pedal keeps vise jaws open or closed without constant foot pressure. The rachet-operated, triple lead thread adjusting screw is locked by a set screw on top of the movable jaw.

The air cylinder is constructed of die-cast aluminum with diaphragm completely encased. Body castings are semi-steel. All operating parts are protected. *Heinrich Tools, Inc.*

Circle 57 on postcard for more data



B-W grinder design speeds dressing, desk changing and set-up.

Grinder Features Sealed Quills

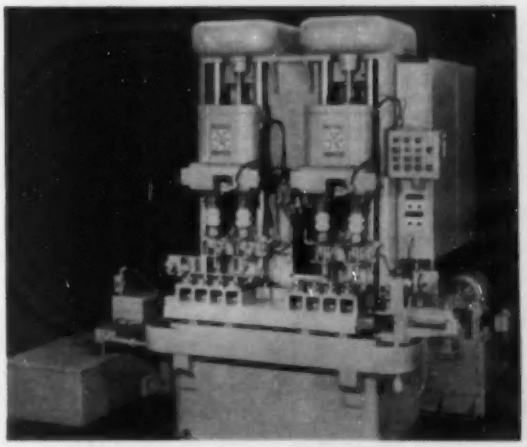
MODEL 240 double horizontal spindle grinder just announced is equipped with sealed spindle quill heads. This construction permits smooth, accurate adjustment of the abrasive disks and avoids transmitting motor vibration to the grinding spindle. Design of the grinder encloses all controls, motor starters and hydraulic units within the machine base. Controls are automatic and are accessible from either side of the grinder. Individual dressers for each disk are push button operated. High speed feeding is achieved through a simple electro-magnetic pick-off disk which supplies work to the grinder in a continuous stream. *Besly-Welles Corp.*

Circle 58 on postcard for more data

Hones Connecting Rod Bores

A PRODUCER of automotive parts is now finishing the wrist pin bore as well as the crank pin bore of a connecting rod on a four-spindle model 710-4 Microhoning machine. It combines two double-spindle machines, each unit having 10-in. stroke capacity reciprocating head assemblies. Each head has individual Microdial automatic stone feed and stonewear compensation plus Microsize automatic sizing control. Controls interlock the automatic index table with machine controls. Each spindle has two fixtures which are indexed laterally at the end of each cycle. This permits the operator to unload and reload one group of fixtures while the other four are in honing position. Gross production is reported as 600 bores per hr. *Micromatic Hone Corp.*

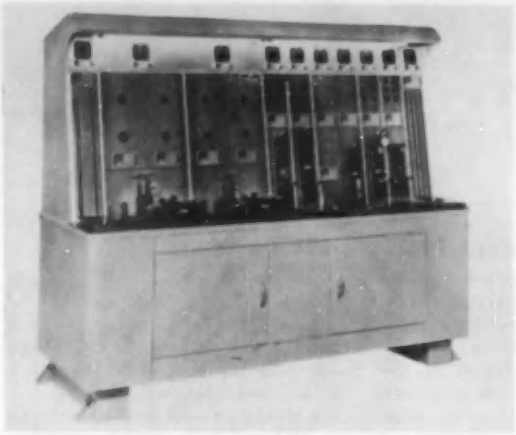
Circle 59 on postcard for more data



New Microhone for connecting rod bores simplified the process, eliminating three operations.

NEW EQUIPMENT PLANT • PRODUCTION

Tool Control Unit



Orderly storage space, by spindles, is provided for two sets of pre-set tools and adapter assemblies on the Cy-Co-Trol tool control unit. Gages on the face are used to set tools. A solenoid actuated counter with pre-set locks out the cycle control of the machine after predetermined count. Lights signal the operator. (Royal Design and Manufacturing, Inc.)

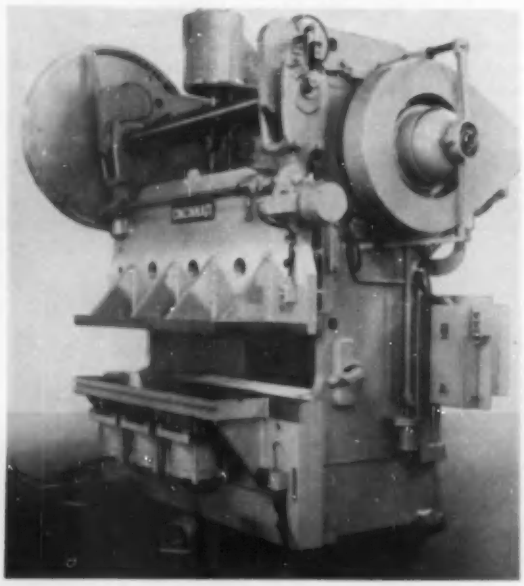
Circle 60 on postcard for more data

Sound Probe

A SOUND amplifying device now on the market is said to reproduce sounds naturally, as deteced by a probe. The unit is designed for trouble-shooting in machinery of all types. *The Gel-Me Co.*

Circle 61 on postcard for more data

Shallow Draw Press Brake

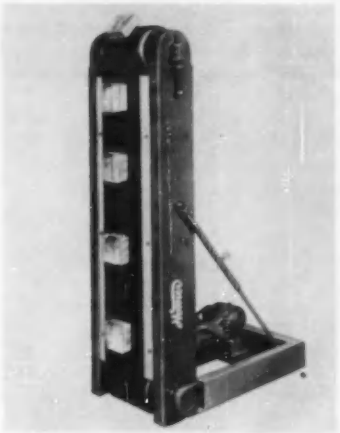


This machine has a 36-in. permanently wide bed and ram with a shut height of 15 in., eight-ft overall die surface, and six 12-in. air cushions mounted on the underside of the bed. Features include an air electric clutch with automatic stop and non-repeat, a two-speed transmission operating at 13 and 30 strokes per minute, an air counterbalance and a five-in. stroke. (Cincinnati Shaper Co.)

Circle 62 on postcard for more data

Magnetic Conveyor

FERROUS pieces and parts such as nuts, bolts, stampings, etc., can be conveyed up inclines as steep as 90 deg with Space Saver magnetic conveyors. Production machinery can be placed closer together. Another application is removing scrap from receiving pits, made possible because they will pick up ferrous pieces from floor level. They also automatically stack flat ferrous pieces, feed machines and perform other handling operations formerly requiring manual effort. *Homer Manufacturing Co., Inc.*



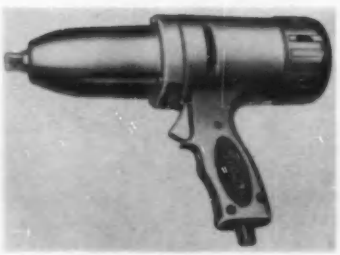
Magnetic conveyors are available in stationary or portable types — standard or custom units for new or existing production lines.

Circle 63 on postcard for more data

Impact Wrenches

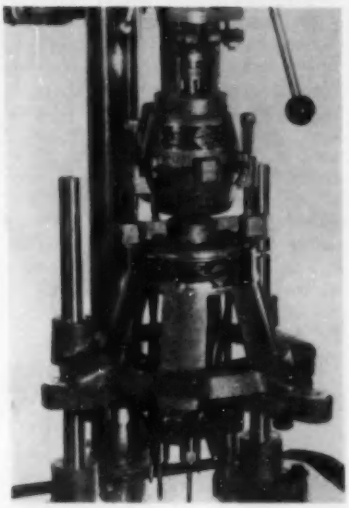
SIOUX electric impact wrenches recently announced are designed for unit running, drilling, and maintenance. A reverse cap switch lock prevents reversing the tool while the switch is on. Model 325 handles cap bolts from ⅜ to ⅝ in.; model 320 handles sizes ⅜ to 11/16 in. Both provide 2000 impacts per minute. *Albertson Co. Inc.*

Circle 64 on postcard for more data



Multiple Head

THE model 600 flexible shaft driven adjustable spindle multiple head is designed for both tapping and drilling up to six holes on any tapping or drilling machine. The use of flexible shaft drives for the spindles enables it to be set in a wide range of hole



Model 600 multiple head.

patterns with a small drive to spindle distance. Spindle adjusting arms can be moved in and out or transversely even while the unit is operating. Jig-bored templates can be supplied in place of the adjusting arms where a fixed-center set-up is desired.

Individual shafts, spindles and adjusting arms are removable as integral units when fewer than six spindles are used. A 1:1 drive ratio permits the unit to be used for lead screw tapping. Other design features of the unit include one-piece hardened and ground grease lubricated gears in the driving head; grooved precision-type ball bearing thrusts for each spindle; hardened and ground guide rods running in bronze bushings in the aluminum alloy head for extra rigidity.

Capacities of the unit range from 1/31 to 5/16 in. drills in steel and No. 6 to 5/16 in. taps in aluminum. Maximum bolt circle is 6 7/8 in. Minimum center distance between spindles is 15/16 in. *Ettco Tool Co., Inc.*

Circle 65 on postcard for more data

Safety Control

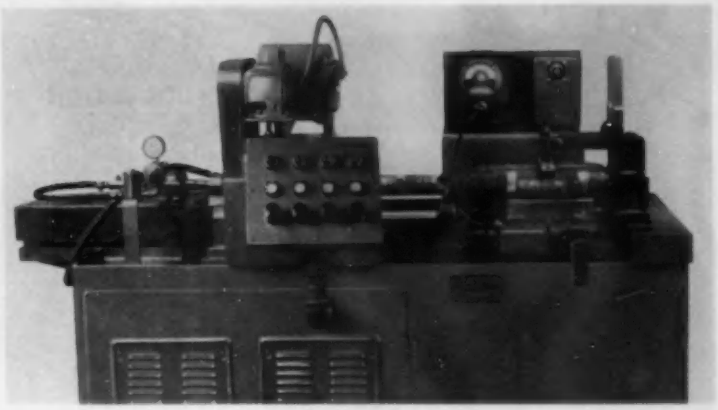
SINGLE-CYCLE control for presses and other machines is the object of the model 200 electrical control system. It consists of a control box mounted between the line voltage source and the solenoid control valve which operates the machine. Either foot or hand switches are used to start the cycle. Operating the switch breaks the line circuit, and connects the solenoid to a source of stored electricity from within the box, sufficient for one cycle of the solenoid. The switches must be released to recharge the control box. *Security Controls, Inc.*

Circle 67 on postcard for more data

Extrusion Presses

A STANDARD line of hydraulic aluminum extrusion presses is expanded with the addition of two new sizes—1400 and 1700 tons. Presses are also available in 600, 900, 1250, 2200 and 3000 ton capacities—in die slide and gate-lock types—in long or short stroke designs. Special sizes range up to 5000 tons capacity. *Watson-Stillman Co.*

Circle 68 on postcard for more data



Superior SA single spindle hone.

Single Spindle Hone Holds Two Parts

WITH a two-position fixture, a large single-spindle automatic honing machine can be loaded or unloaded while one piece is being honed. The model SA machine requires one operator. Automatic air gaging has been built into the honing mandrel which, after each honing cycle, moves into the bore and gages the part just honed. Movement of the honing head, fixtures and air gages is hydraulically controlled and actuated by solenoids.

Constant pressure on the stone expansion is maintained by air which also controls rapid expansion and release of the honing stones at the beginning and end of each cycle. A built-in electric timer allows variable cycling. The machine has a fabricated steel base containing the hydraulic system and coolant unit, with the electrical control panel mounted on the back. The spindle is driven by a ½-hp motor, the hydraulic system by a one-hp motor, and the coolant system by a 1/10-hp 220/440 Ruthman centrifugal-type pump. Each machine is built to customer's specifications. *Superior Hone Corp.*

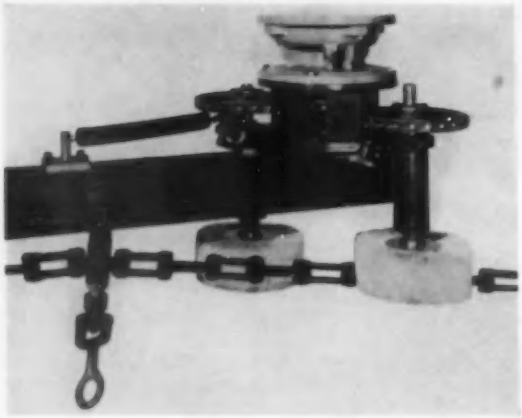
Circle 66 on postcard for more data

Air-Clutch Press

AIR-CLUTCH HI-FLEX OBI presses have now been added to a standard press line. Electric-pneumatic controls may be set on inching, single stroke or continuous operation at high or low speed, and the press may be stopped at any position of the slide. The air balancing unit will cushion slide movement on top and bottom of the stroke. It will also prevent the slide from dropping, due to possible connection or pitman failure. An automatic lubrication unit is mounted between uprights in back of the press. A keyway in the crankshaft is provided for roll feed, scrap cutter, etc. Tie rods and tie rod spacers are provided to make it possible to use these presses for precision, lamination and other high production stampings. Air-Clutch change-overs are possible on presses with pin type clutches now in operation, without replacement of the crankshaft. *Walsh Press and Die Co.*

Circle 69 on postcard for more data

NEW EQUIPMENT PLANT · PRODUCTION



Fuller chain brusher.

Conveyor Brush

DUST and dirt which sticks to lubricating oil on overhead conveyor chains can be automatically eliminated without work stoppage. The conveyor chain brusher is mounted on the monorail supporting the chain conveyor, and the two brushes, powered by one 1-hp motor, pivot on the motor base and bear against the conveyor chain. The brushes can be swung away from the chain if cleaning is desired only periodically.

Tampico fiber, nylon and crimped steel wire are materials frequently used in these brushes. The fill is driven by a heavy wire staple through a continuous steel channel so that each tuft is held securely, providing strong, long wearing construction. *Fuller Brush Co., Machine Div.*

Circle 72 on postcard for more data

Lift Trucks Approved

TYPE EE Underwriters' Laboratories Approval has been granted K51 electric fork trucks in capacities from 1000 to 3000 lb giving the manufacturer a complete line of hazard proof trucks from 1000 to 10,000-lb capacity. In order to meet UL requirements, the trucks have enclosed wiring and motors. The actuating Magnetic Cam-O-Tactor is positioned in a special steel box. Resistors are totally enclosed with a thermostat which automatically cuts off power when the enclosure reaches a temperature of 300 F. A preserved wood lining is placed beneath the battery box cover and side vents are covered with a steel screen to prevent accidental battery shorts. Trucks are fitted with an approved drag strap for static discharge and an approved type electric horn. *Yale & Towne Manufacturing Co.*

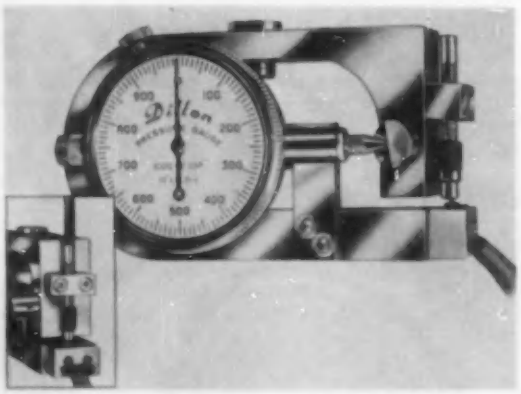
Circle 70 on postcard for more data

Magnetic Separator

A new line of Delpark-Dings magnetic coolant separators are designed for separation of metal particles from coolants for honing, lapping, grinding, shaving, broaching, milling, metal roll forming mills, and other processes. These units may be used independently where partial separation is adequate. They may also be used for pre-filtration separation to reduce load on filters. Capacities to 100 gpm are being made. (Industrial Filtration Co.)

Circle 73 on postcard for more data

Gage Also Controls Pressure



Adaptation of a mechanical pressure gage to electrical control was recently displayed. A small Micro-Switch operates at a preset pressure on the gage, which is offered in 10 capacities from 0-10 to 0-10,000 lb. (W. C. Dillon & Co.)

Circle 71 on postcard for more data

Impact Wrenches

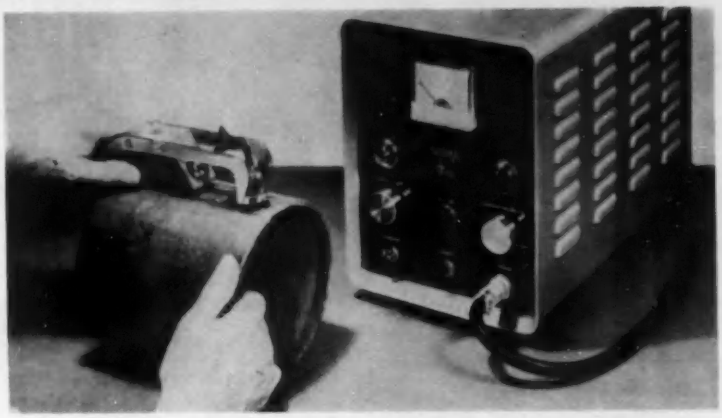
TWO 180-cycle electric impact wrenches of the No. 24 series are now being produced. Both models are ½ in. square drive wrenches designed with heavy section metal in the rear field case and steel impact housings to protect them from abuse. Model HF24R features a reversing button in the handle to permit the operator to reverse the tool with his thumb, for complete one hand operation. Model HF24 is non-reversible. *Thor Power Tool Co.*

Circle 74 on postcard for more data

Detector Measures Depth of Crack

THE Sedac SE-100 electronic seam depth indicator can nondestructively detect and measure the depth of surface cracks in iron and steel. The portable eddy current-type instrument has a scanning probe on a ten-ft cable. Relatively symmetrical parts can be scanned automatically, with the reject relay included. The device will locate and measure the depth of defects from 0.012 to 0.120 in. deep. Larger cracks are detected but their size over 0.120 in. is not measured. It can be calibrated to find only cracks deeper than a pre-selected minimum, on flat pieces and curved surfaces with a 3½ in. or larger radius. *Magnaflux Corp.*

Circle 75 on postcard for more data



Close-up of type SE-100 Seam Depth Indicator showing how it can be used in hand scanning parts for detection, depth measurement, or both.

Tube Tester

A 100,000-lb capacity tensile testing machine for testing the butt welds in the thin wall square tubing now is being used for certain automotive frames. It tests both 2½ and 3½ in. square tubing without alteration, because it has two stations, one on each side. The difficulty in holding this kind of specimen was overcome with a hydraulically operated mandrel and gripping device. This type of machine is available with either one station or two and may be had with specimen holding devices to suit the tube being tested: square, rectangular, round or oval. *Detroit Testing Machine Co.*

Circle 76 on postcard for more data

Helical Broach

HELICAL external gears now can be produced by broaching. According to the company, the primary advantage of the new method is the extremely low production cost, while accuracy and finish are comparable to that given by other gear production methods. It is believed that broached gears will run more smoothly because of the absence of the minute surface ripples.

A recent comparison was made of the cost of tooling up a plant to produce a helical gear in quantities of 30,000 per day. To produce the gear by hobbing required an investment of nearly $2 million in machines and tools, while the job could be done for $70,000 if the gear were to be broached. Subsequent production costs were also considerably less with broaching, according to the company.

The large initial cost differential was due to the lower cost of broaching machines and the fact that fewer machines were required. In a plant operated by this company for gear production, for example, production rates of 20,000 finished gears per day per machine reportedly are not uncommon. Machines are automatically loaded and at least one part is finished at every pass of the broach. Occasionally it has been possible to complete up to eight gears with a single broaching stroke. The tool design is an adaptation of pot type broaching which allows quick replacement of individual broach teeth. As the blanks pass through the center of the broach they are guided only by the broach and teeth and need not be center piloted. *General Broach and Engineering Co.*

Circle 77 on postcard for more data

Parts Feeder

LARGER, heavier parts may now be positioned as required and fed automatically to all types of packaging and processing machines by the model EB-2-B vibratory parts feeder. The new model is equipped with a 30 in. diameter fabricated bowl actuated by an electromagnetic reciprocating motor, will move odd shaped parts up to four in. long up and around the spiral track or ramp to the single, double or multiple discharge points. The speed at which the parts are discharged can be regulated. *Syntron Co.*

Circle 78 on postcard for more data

Mobile Lubricator

The Aro Prime-Lubricator, a compact self-propelled lubrication unit, is powered by a six-hp Wisconsin engine. It includes compressor, air tank, space for three 100-lb drums, tool trays, service hoses, and lubricant pumps. (The Prime-Mover Co.)

Circle 79 on postcard for more data

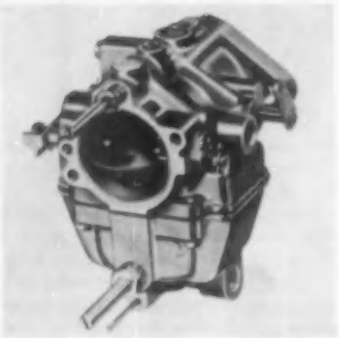
NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Blade for Sharply Curved Windshields

For higher frequency rain lifting, the Panoramic Rainbow blade is offered giving 280 wipes per minute. It is controlled by a self-normalizing arm, to walk around the sharp side curvature. This blade is not precurved and its backing is not preformed. But the rubber and its backing are both pre-flexed by hingeless, flat springs of the carrier mechanism. This reduces the height of the turning couple, lessens the leverage of cling and inertia, and minimizes arm twist. Spring counterbalanced levers are fully nested. *Trico Products Corp.*

Circle 26 on postcard for more data



Carburetor for 25-40 Hp Engines

Features of the aluminum OM Series carburetor for larger industrial-portable two- and four-cycle engines include dual inlet connections, located on either side; body casting of aluminum, which reduces the weight 60 per cent over either zinc or cast iron; push drain valve, and inlet needle and seat with a rubber insert.

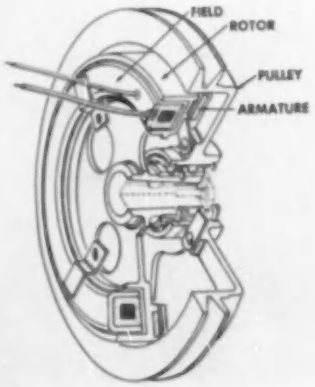
This series is designed for the range of portable outboard and/or industrial engines developing from 25 to 40 hp. It is said to have a high tilt tolerance in all directions. No leakage of fuel is found when an engine is tilted 50 to 60 degrees in either right, left and "flange down" positions, 80 degrees in "flange up" position. *Tillotson Manufacturing Co.*

Circle 27 on postcard for more data

Propeller Shaft for PTO

The Series 1001-1008 unwelded propeller shaft and joint assembly has a wide range of applications to power take-offs in the agricultural and industrial fields. A major feature is its adaptability to any desired length of shaft up to 77. The unit is designed to fit all Spicer 1000 series and yokes. Specifications include a swing diameter of 2½ in.; lubrication fitting; clearance for momentary angles up to 60 deg; non-rotating hinge angle up to 90 deg; and blowout-proof seals. Maximum continuous speed is 1750 rpm. *Dana Corp.*

Circle 28 on postcard for more data



Compressor Clutch

An electric compressor clutch for air conditioning makes it possible for motorists to start and stop the compressor by manual or thermostatic control. A toggle switch mounted on the dashboard makes manual operation possible. The air conditioning system can be connected or disconnected when wired to the compressor clutch. The clutch also can be controlled by a thermostat. It operates on the stationary field principle, without slip rings and brushes. *Warner Electric Brake & Clutch Co.*

Circle 29 on postcard for more data

Coated Fabric

A flexible plastic material that combines the workability of film and the strength of a heavy coated fabric, Nygen Tolex, has many of the characteristics of leather. It is said to be ideal for deep seat cushion upholstery for furniture and automotive applications. It has a special non-woven base to give balanced stretch in all directions and an excellent recovery. The base material provides bulk and a most desirable hand to the finished product. *Textileather Div., General Tire & Rubber Co.*

Circle 30 on postcard for more data

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Laminated Plastic 1

Dilecto laminated plastic catalog D-55 gives 17 pages of data on over 50 fillers and resins combined by lamination and polymerization. *Continental-Diamond Fibre Co.*

Input Controller 2

Bulletin F5726-1 describes the Inputrol, an automatic input controller for accurately controlling input rate of electrical power as well as the flow of liquid or gas to any process in accordance with changes in the measured variable. *Barber-Colman Co., Wheelco Instruments Div.*

Magnetic Switch 3

The magnetically operated, glass enclosed Glaswitch, a sensitive control element for general industrial applications, is described in Engineering Bulletin 1057 available from *Revere Corp. of America.*

Investment Casting 4

The Accumet process of precision investment casting by the lost-wax method is described in a 16-page publication. *Crucible Steel Co. of America.*

Toolholders 5

Toolholders with negative rake, throw-away blanks and inserts are priced in catalog VR-435B. *Vascoloy-Ramet Corp.*

Lubricating Tools 6

Automatic lubrication systems for use on machine tools, on-the-job applications and various system components are illustrated in bulletin 5410, *Trabon Engineering Corp.*

Paint Methods 7

Technical bulletins, Nos. 12 and 13, on dip tank and flowcoat finishing have just been prepared. The eight-page, illustrated bulletins describe the processes, discuss advantages and disadvantages of the two finishing techniques. *Du Pont Finishes Division.*

Conveyor Catalog 8

A 16-page catalog showing the entire line of Rapistan conveying equipment includes gravity wheel and roller conveyors and related accessories, power belt conveyors from aluminum models to heavy-duty interfloor and horizontal steel models, the Flow Rack conveyorized storage rack, and the Press-Veyor series of cleated production belt conveyors. *The Rapids-Standard Co.*

Special Wire 9

Silicone rubber-insulated high-temperature wires and cables are described in a booklet, 19-594, which covers listings and specification data on power cable, control cable, appliance and fixture wires, apparatus leads, heating cable, defroster wire, aircraft wire, shipboard cable, and generator leads. *General Electric Co.*

(Please turn page)

VOID After August 15, 1955 **6/15/55**

Circle code numbers below for Free Literature, New Plant Equipment or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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Readers Service Dept.

Slitting Equipment 10

Gang slitters and accessory equipment, both standard and custom-engineered ranging in size from hand-operated, bench mounted slitters to fully automatic slitting lines, are covered in circular No. 898-S-2. Three basic types are conventional driven slitters, pull-through slitters and combination slitters. *Waterbury Farrel Foundry & Machine Co.*

Fine Pitch Hobs 11

An informative booklet on fine pitch hobs is fully illustrated and contains numerous charts and diagrams to cover the recently announced American Standard 20-Deg Involute Fine-Pitch System. *Illinois Tool Works.*

Readout Systems 12

Multiple pressure readout systems to speed up data handling for process industries, wind tunnels, engine test facilities, and others are illustrated in 12-page catalog 58-15. *Fischer & Porter Co.*

Illuminated Switch 13

Push button switches with illuminated heads feature high pretravel. Data sheet P98. *Micro Switch Div., Minneapolis-Honeywell Regulator Co.*

Versatile Loader 14

The Cary-Lift long reach fork truck, with its double-jointed overhead arm attached at the rear, is described in a 36-page brochure, P185. *Pettibone Mulliken Corp.*

USE THIS POSTCARD

High-Temp Alloy 15

Detailed performance data on alloy A-286 is furnished in a new technical data folder recently published. It is a corrosion- and heat-resistant austenitic alloy, which has very high strength at temperatures up to 1300 F, but can also be used above these temperatures for lower stress applications. *Allegheny Ludlum Steel Corp.*

Drilling Machines 16

Its line of hydraulic feed, vertical way-type multiple-spindle drilling machines, with fixed or variable center, feature direct drive. Catalog 700 pictures and gives capacities of six sizes. *Barnes Drill Co.*

Electronic Drill 17

The M-500 electronic machine for precision drilling, die sinking, broaching and reaming will increase tool life yet operate on workpieces after final heat treat. Catalog offered. *Elox Corp. of Michigan.*

Gage Laboratory 18

Details of its facilities and services to industry for checking gages are outlined in a small booklet. *Midwest Gage Laboratory, Size Control Co.*

Leaded Steel 19

Described as the fastest machining leaded alloy steel in its carbon range, New Rycut 50 alloy steel is supplied in both the annealed and quenched-and-tempered condition. Bulletin 14-6. *Joseph T. Ryerson & Son, Inc.*

Solenoid Valves 20

A variety of solenoid-operated valves, in stainless steel, zinc and brass, are shown and specified in catalog D2, 48 pages. Types for machines, processes, vehicles and aircraft are included. *Skinner Electric Valve Div., Skinner Chuck Co.*

Powdered Metal 21

A 52-page treatise on powder metallurgy, manual E-55, is liberally illustrated with photos, tables, charts and graphs. Additional illustrative material is presented in the form of case histories involving the kind of information most pertinent for both actual and potential users of metal powder parts. *Amplex Div., Chrysler Corp.*

Colored Aluminum

Variety of textured and colored finishes possible with aluminum and its alloys is presented in a 48-page four-color book. Write on letterhead to *Aluminum Co. of America, 762 Alcoa Bldg., Pittsburgh 19, Pa.*

VOID After August 15, 1955 **6/15/55**

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FIRST CLASS
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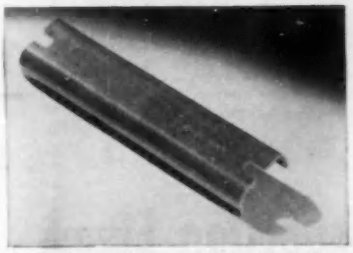
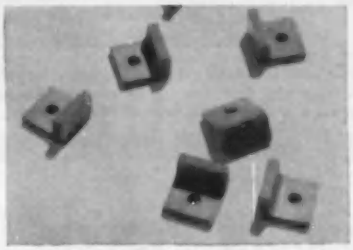
New York, N. Y.

C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



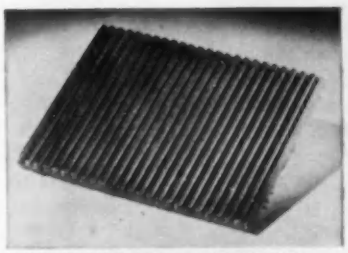
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



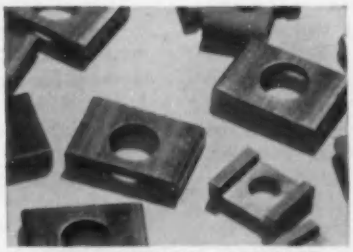
C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

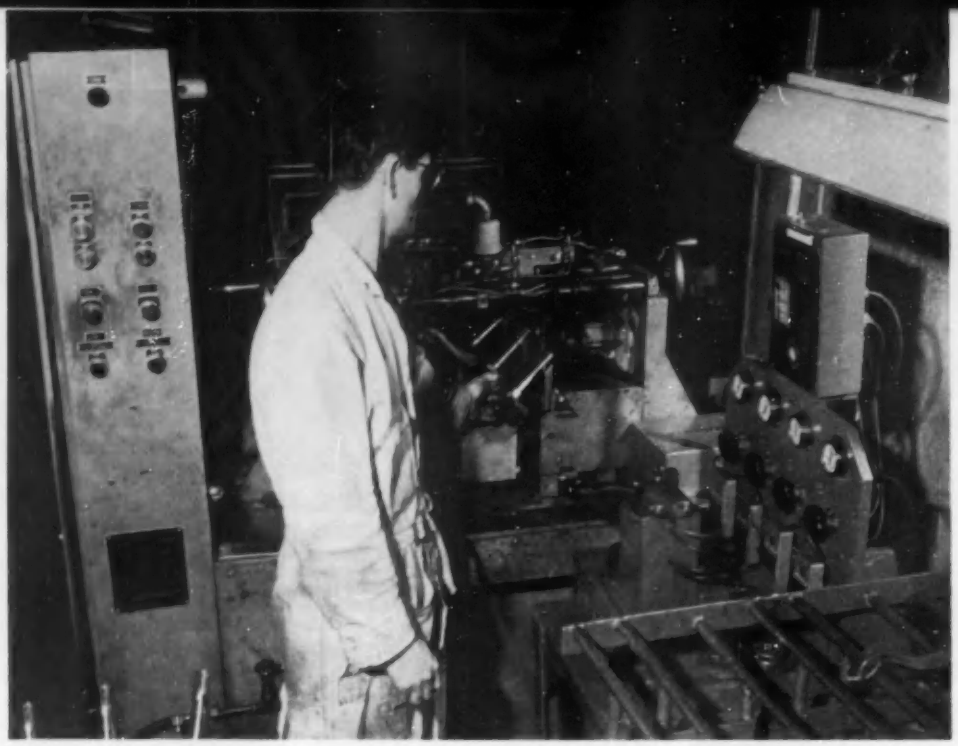
C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 2, DELAWARE



End view of Magnaflux installation. Final inspection is done at the gaging station in the foreground; then the inspector places the workpiece on the first station of the shuttle conveyor in the center. The curtain in the center background encloses the first of the Magnaglo inspection booths.

Automated Magnetic Particle Inspection Lines

Two Magnaflux Magnaglo inspection lines designed specifically to handle finish-machined front wheel spindles with the maximum of automaticity feasible for this kind of inspection are installed at Ford Motor Company's Mound Road plant.

The specialized magnetic particle inspection line consists of a number of related functions tied together into an automated operation. At one end, the finish-machined spindles are delivered to a final inspector for dimensional inspection and he, in turn, loads an accepted spindle onto the first station of a short "grasshopper" or shuttle conveyor section. This is a "headshot" or circular magnetizing station. The shuttle conveyor moves the work out of this station and deposits it onto an automatic mesh conveyor for transport through the rest of the cycle.

As the part moves along the belt conveyor it passes an automatic spray station where it is coated with fluid carrying the magnetic particle material. At this point the part enters the first Magnaglo inspection booth where it is picked up by the inspector and scanned visually for possible defects. The part is then returned to the conveyor for transport to the next phase of inspection.

Here it enters the second magnetizing station where the part is magnetized longitudinally while moving through a coil, sprayed once more, and picked off the conveyor by the inspector in the second booth. Upon acceptance by the latter, the part is returned to the conveyor, leaving the line through a demagnetizing coil. It is manually unloaded at the conveyor's end.

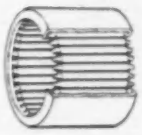
This single-purpose automated inspection equipment is said to be considerably more economical than earlier installations. Although the current equipment is not intended for rapid changeover to another type of part, it does lend itself readily to changeover in the event of a change in product design.

While functional economy is an important consideration at Ford, all equipment must also conform to the requirements of accessibility and simplicity for maintenance. To this end, the control cabinet is located accessibly and is wired to meet JIC specifications so far as is possible on magnetic particle inspection equipment. Other electrical components, too, have been made readily accessible.

Similarly, the self-contained system for handling the fluid containing the magnetic particle material has been greatly improved. It incorporates a newly developed agitation means; requires only infrequent attention. The filter for the system has been located on the outside of the unit, rather than under the tank, to make replacement a simple matter.

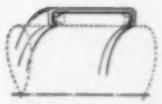
TORRINGTON

DC needle bearings give high-capacity performance in minimum space

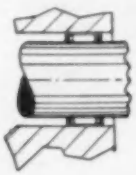


Unique construction—accurately drawn, surface-hardened shell retains rollers and serves as outer raceway.

Full complement of small diameter rollers—precision-ground and through-hardened—assures top capacity by distributing load over large number of contacts.



Turned-in lips of the case-hardened outer shell keep dirt and grit out, lubricants in—while retaining trunnion ends of rollers. All wear surfaces of outer race are case-hardened.



No inner race required on surface-hardened shafts—reduces space requirements, lowers unit costs.

Simple assembly—arbor press seats bearing in round housing bore. No collars, shoulders or retaining rings needed.

Closed end type DC Needle Bearings are available for stub shaft applications. The closed end provides a perfect seal at no extra cost.

Needle Bearings are made in a Precision Series for most applications and an Extra Precision Series where low radial play and minimum eccentricity are required. Easy lubrication through optional hole in shell or through hole in shaft assures long service life. Bearings can be pre-packed with suitable grease for those applications requiring grease lubrication.

See our new Needle Bearing Catalog in the 1955 Sweet's Product Design File—or write direct for Catalog No. 55.

THE TORRINGTON COMPANY

Torrington, Conn. **South Bend 21, Ind.**

District offices and distributors in principal cities of United States and Canada

TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

200-Amp Relays

Two new relays developed for switching the high currents in aircraft 28-v d-c systems meet all requirements of Specification MIL-R-6061. Both are single pole, single throw and are identical except for

mounting. The JH28007-1 relay (left) conforms to an AN3370-1 mounting while relay JH28007-2 meets an AN3370-2 mounting.

Rated 200 amps, the relays operate on a nominal coil voltage of 24-28 v with 29 v the maximum operating voltage. The relays pick up at 18 v and drop out at 7 v (+0,—5.5 v).

Designed for continuous duty (50,000 cycles minimum), the relays are said to function efficiently at altitudes to 50,000 ft, within an ambient temperature range of —55 to 71 C, and under acceleration forces to 10 G. *Jack & Heintz, Inc.*

Circle 36 on postcard for more data

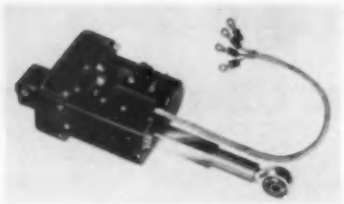
Turnbuckle

A so-called self regulating turnbuckle has been manufactured to provide compensation in the control cables of a twin-jet, high altitude bomber of up to 2¼ in. Model J572 turnbuckle (individually or in series) can be used as a measuring instrument in test flights of prototypes. When the required amount of compensation is determined from extreme actual conditions, the proper size can be specified for production models in the accepted control system, without change in design of the aileron, elevator and rudder structures. By providing cable tension regulation, the initial rig on the ground at normal temperatures can, with safety, be materially decreased, thus reducing stress and friction. *Bobrick Mfg. Corp.*

Circle 37 on postcard for more data

Linear Actuator

Type ACT-3090 linear actuator, weighing 1.40 lb, combines the motor and gear train into one unit. The rate may be changed between 1.6 and



30 ipm by substituting two gears. Other features include low end play, a continuous self-lubricating method on the close-tolerance Acme screw, overload clutch, special limit switch actuator. *John Oster Mfg. Co.*

Circle 38 on postcard for more data

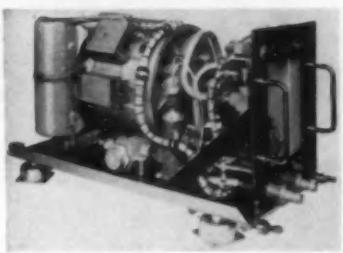
Small Preamp

The Glennite Model F 410 subminiature preamplifier was designed for use with missiles, aircraft, and other devices where size, weight, and power consumption are of paramount importance. This six-oz unit has been constructed ruggedly for the most exacting work in coupling low level signal devices into standard metering and recording systems without introducing extraneous noise from vibration. It is 2 11/16 in. wide, 1 3/16 in. high, and 2¼ in. long. Power requirements are: filament, 6 v or 28 v, plate, 105 to 250 v. A four-tube unit, this device incorporates a cathode follower input to give an input impedance of 100 megohms. It has selective gains of 10, 30, 100, and frequency response from 5 cps to 20,000 cps. *Gulton Mfg. Corp.*

Circle 39 on postcard for more data

Coolant Unit

Model RR-10850 airborne electronic coolant unit is designed for automatic control of fluid output temperature for cooling electron tubes in aircraft. Heat exchanger, air blower and oil circulating pump are driven by a



common motor. Accessories include thermal switches, by-pass valve, flow switch, supply tank, etc. The circulating pump has a capacity of two gpm at 2700 rpm. Coolant to be pumped is Monsanto OS-45 Hydraulic Fluid. Maximum pressure 110 psia. The 0.3-hp motor requires 700 watts maximum. *Lear, Inc., Lear-Romec Div.*

Circle 40 on postcard for more data

Fuel Connector

A flexible fluid connector for aircraft fuel or oil systems reportedly withstands extreme flexing movement and vibration without material fatigue. Constructed of rubber impregnated fiber glass, this connector has a fuel resistant seamless liner of specially compounded synthetic elastomers. Cured under 2000 psi pressure, the layers of fiber glass and rubber are fused into one strong integral tube to handle aromatic fluid such as Mil-H-3136 Type I or Type III without leakage.

Compared to metal parts, this fluid connector is not subject to resonance fatigue, and will take shear axial misalignment. *Arrowhead Rubber Co.*

Circle 41 on postcard for more data

SCHWITZER-CUMMINS Specialists IN FANS FOR ALL INDUSTRIES

Illustrating a 60,000 CFM fan—72" diameter—as furnished for stationary engine application for the oil fields.

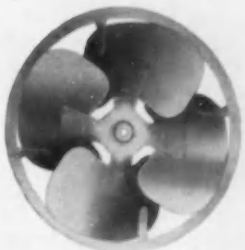
For 37 years we have supplied fans of all descriptions to the leaders in many different industries, automotive and stationary. We are so well equipped in experience and facilities that you will find us a superior source for your fan needs. We can meet your own specifications on fans of all sizes and types from 6" to 84" no matter what the operating characteristics, the blade shape, or material.

Send us your specifications and see if we cannot furnish you with a superior fan that will improve performance and save you money.

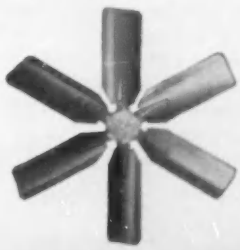
AMONG THE MANY INDUSTRIAL USES FOR WHICH SCHWITZER-CUMMINS IS A MAJOR SUPPLIER OF FANS ARE—

- INDUSTRIAL ENGINES
- GENERATING SETS
- MINING EQUIPMENT
- AIR CONDITIONING
- CORN PICKERS
- AIR COMPRESSORS
- LOCOMOTIVES
- WIND CHARGERS
- CROP DRYING
- OIL DRILLING
- FILTER AND PURIFYING
- INDUSTRIAL VENTILATION
- UNIT HEATERS
- COOLING TOWERS
- DRY KILNS
- TRUCK REFRIGERATION
- MARINE VENTILATION
- PORTABLE WELDERS
- FIRE ENGINES
- ALL DIVISIONS OF AUTOMOTIVE MANUFACTURE

A Type in General Use for Window Air Conditioners and Kitchen Ventilators



Condenser Fans for Small Air Conditioners



Large Exhaust Fans for General Ventilation, Attic Ventilators, etc.

SCHWITZER-CUMMINS COMPANY

1125 MASSACHUSETTS AVE. · INDIANAPOLIS 7, INDIANA

Cooling Fans for Over a Third of a Century

The BUSINESS PULSE

Rate of Expansion of Business Activity Slowing Down. Large Gains in Steel Output Impossible as Operations Have Already Been Pushed Almost to Capacity. Number of Unemployed Continues to Decline.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Changing Business Pattern

General business activity remains at very high levels, but it no longer seems to be expanding at anything like the same rate that it was in the autumn and winter months. This is in no way surprising, since it had been evident all along that the earlier rate of gain was too great to be maintained for an extended period.

The performance of the Federal Reserve Board's seasonally adjusted index of industrial production illustrates the changing nature of the business pattern. In April the index stood at 136 per cent of its 1947-49 average, 13 full points above the recessionary low of 1954 and only one point below the all-time high of mid-1953. While this represents a truly impressive gain, certain evidences of leveling out are of more analytical significance for the present. In each of the four months from October, 1954, to January of this year—that is, when the business upswing was most vigorous—the Federal Reserve index rose by two full points, on a seasonally adjusted basis. This was equivalent to an annual rate of gain of 20 per cent. But in February the index rose by only one point. In March another two-point gain was registered, but then in April there again occurred a rise of only one point. To judge from incomplete data available at this writing, some further expansion probably took place in May, but it seems unlikely that the index number for that month will show an increase of more than one point.

This evidence of a slowdown in the rate of expansion is of such recent origin that it would be unwise to read too much into it. But it is certainly worth taking into account, for just such a development was to be expected on logical grounds. It was inevitable that, as more and more of the idle capacity which existed last summer was taken up, further gains would be increasingly difficult to effect. The evidence of a slowdown, moreover, is not restricted exclusively to the Federal Reserve index of industrial production. The index of business activity compiled by the Guaranty Trust Company declined moderately during April, after five successive monthly increases. In addition, trends in such industries as steel, construction, and automobiles—where the upswing began last fall—suggests a leveling out of activity.

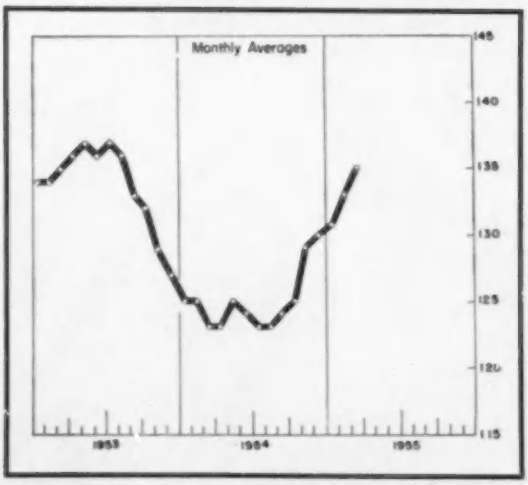
Steel Ingot Production At 97 Per Cent of Capacity

In the case of steel, the big deterrent to further increases in output is the fact that operations have already been pushed almost to capacity, rendering large additional increases a physical impossibility. (Ingot production appears to have averaged out at about 97 per cent of capacity in May.) Thus, there

(*Turn to page* 178, *please*)

INDUSTRIAL PRODUCTION INDEX

1947-49 — 100 (Adjusted for Seasonal Variation)

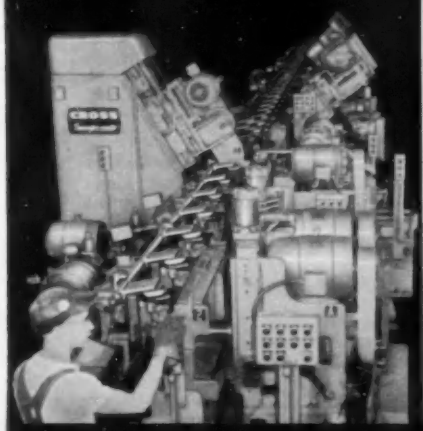


Source—Board of Governors, Federal Reserve System, and National Research Bureau

Warner Gear Reduces Downtime with Cross Machine Control Unit

A Mechanical Eye...

At right, set-up man pre-sets tools at Warner Gear Division, Borg-Warner Corp. for Transfer-matic below.



"We are well satisfied with the results we have obtained from the Cross Machine Control Unit," says Emory Watson, Master Mechanic of Warner Gear Division of Borg-Warner Corporation.

Warner Gear's experience is typical of many users. Over 500 Cross Machine Control Units are successfully reducing costs of many metal cutting operations. Here's why:

Toolometers on the Machine Control Unit assure improved tool changing programs and maximum tool efficiency. Tools—pre-set with standard fixtures and gages to eliminate machine adjustments and trial cuts—are stored in the Machine Control Unit convenient and ready when needed. Results: Reduced tool costs . . . less downtime . . . higher operating efficiency.

You can get the same cost saving benefits as Warner Gear. Write, wire or phone The Cross Company for full information, today.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

AIR BRIEFS

By RALPH H. McCLARREN

Armed Forces Day

May 21, 1955, was a day of display for the Department of Defense. Throughout the country various Army, Navy, Air Force and Marine establishments opened their doors and many of their latest weapons and vehicles to the public. Probably the mightiest exhibit was at Washington, D. C., at Bolling Field. Here were shown many new tanks, guns, missiles, aircraft, helicopters and transport vehicles.

In Philadelphia, Pa., the Naval Air Development Center at Johnsville opened the human centrifuge test facility to the visitors. Its equipment provides the scientist with means to measure the effects of high accelerations as related to supersonic flight. Many other advance developments were shown, including radio controlled (drone) airplanes, fire control systems, sonar detecting devices, radar, bombs and rockets and the aircraft used to flight test the new developments. This day of demonstration gave visual proof of the armed might of the United States and their effort through research and production to keep ahead of any potential enemy.

Unmanned Helicopters

Helicopters without pilots may determine what is around the "next corner" or what is on the "other side" of a hill for ground troops in future wars. Already successfully flight tested and now being evaluated for the U. S. Navy, one model helicopter is presently going through all the paces peculiar to rotary wing aircraft—without a hand touching the controls.

It is capable of taking off, landing, flying backward, forward, sideways and hovering. In over a year of experimental flying, the aircraft has logged well in excess of 100 hours in the air.

Although operating the remote control 'copter is much more complicated than flying a similarly controlled fixed wing aircraft, tests so far have been highly successful.

Its use as an unmanned air weapon covers a wide range of possibilities. Loaded with nothing but television equipment, the helicopter could be sent far into enemy territory, flashing actual pictures of installations and equipment back to a control center without endangering the lives of personnel.

Tenth Birthdays

June of this year marks the tenth anniversary of the founding of the International Air Transport Association (IATA) and the International Civil Aviation Organization (ICAO). Special meetings to celebrate the event were held in their headquarters building, the International Aviation Building, Montreal, Canada. A special form meeting was held on June 4 at the Canadian International Trade Fair in conjunction with the Annual Meeting of the Aviation Writers Association (Toronto, Canada, May 30th to June 4th).

These two international organizations, IATA and ICAO, have done much to standardize transport and civil aviation activities throughout the world. Procedures have been established which greatly aid in the operation of aircraft from country to country.

A Plane Every 51 Minutes

To meet the continued demand for utility and executive airplanes the Piper Aircraft Corp. is now turning out one plane every 51 minutes of the working day. They expect to be making two twin engine Apaches a day, along with five Tri-Pacers, and three PA-18's each day in the near future. Their good record is being reflected by most of the other personal and executive plane manufacturers. Here is the shipment record of seven companies for March and April, 1955:

Shipments	March	April
Aero Design	6	10
Beech	61	64
Cessna	176	148
Mooney	2	4
Piper	204	198
Taylorcraft	1	1
Call Air	1	1
TOTALS	451	426
Net Billing Price	$6,421,000	$6,459,000

Over 200 Aero Commanders

An aircraft company took delivery of the 200th twin-engined Aero Commander produced by Aero Design and Engineering Co. of Bethany, Oklahoma. It

(*Turn to page* 156, *please*)

Model 1436

with SYNCHRO-START *Automatic* ENGINE CONTROLS

STARTING

When power is demanded SYNCHRO-START will automatically start the engine from any type of remote pilot switch, such as power failure switch, temperature switch, float switch, pressure switch, line voltage drop, etc.

PROTECTING

While the engine is running, it is fully protected against any abnormal condition, such as low oil pressure, overheating, failure of fuel or ignition, overspeeding, etc. . . Any such failure will shut the engine down before damage can result. The interrupted and overall cranking limit features protect the starting motor and battery.

STOPPING

When power is no longer needed, SYNCHRO-START will automatically stop the engine—shut off battery current, ignition, fuel—water—air—or whatever is necessary for a perfect stop and reset the controls for the next power demand.

SIGNALING

In case of any failure of the engine while running or failure to start, the SYNCHRO-START controls will stop the engine and any desired ALARM or SIGNAL may be used to summon an operator and a signal light in the front of the cabinet will show the exact cause of the trouble.

SYNCHRO-START GIVES *Continuous* AND *Full Automatic* OPERATION

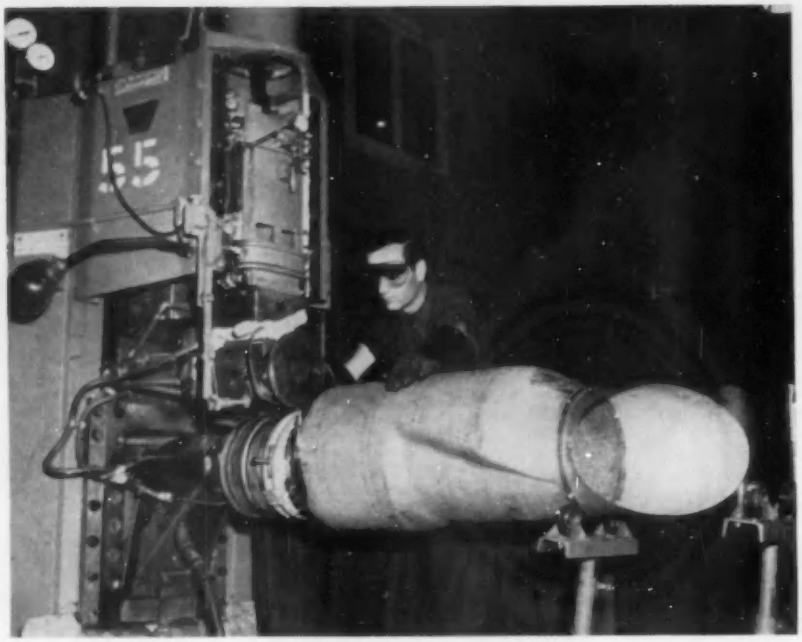
SYNCHRO-START Controls have been providing safe, dependable AUTOMATIC power for America's largest dams, bridges, irrigation projects, commercial and institutional jobs of refrigeration, air conditioning and power generation, mine and oil field pumping, theatres, hospitals, marine installations, radio stations, fire protection, Army, Navy and Air service installations, pipe line booster stations and scores of other main, auxiliary or emergency uses.

Other SYNCHRO-START products include Solenoids, Overspeed Governors, Automatic Cranking Controls, Safety Stop and Alarm Sets, Multiple Engine Load Control Panels, Fire Pump Panels, Oil and Water Switches, Power Failure Relays, Remote Control Stations, Magnetic Contactors, and all types of relays for special applications. Your engine dealer can furnish you with SYNCHRO-START Controls, or, write direct to us for details.

SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS



Stainless steel sections of muffler are seam welded together on resistance welding machine. Silencer will clamp to exhaust system.

Exhaust Silencers for PISTON ENGINES

On Large Aircraft

RYAN Aeronautical Co. is building hundreds of silencers to muffle the exhaust of airliner engines. Fabricated from welded stainless steel, these silencers are based upon an acoustic design developed by the Maxim Silencer Co.

The muffler is about four feet long and 15 in. in diameter and consists of two major shells. The inner shell is a rolled cylindrical tube which is perforated with thousands of $\frac{1}{8}$ in. diameter holes spaced only 1/16 in. apart, making it a veritable screen. The outer shroud section is formed in two half-stampings on drop hammers and resistance-welded into an irregularly-shaped cylinder. The sections are bolted together, one within the other, in such a way that a tapered air space is left between them. Curled strands of Inconel wool are packed into this space in uniform thicknesses.

The mufflers are designed to deaden the noise from the engines by both trapping sound energy and damping vibration. As the exhaust gases pour through the inner muffler section, they expand through the thousands of perforations. The higher frequencies of sound are attenuated by the perforations, which break up the wave forms, and the Inconel wool which absorbs their energy in the form of heat. The lower frequencies of the sound created are attenuated by deresonatting, or damping, the exhaust system through the location and mass of the muffler. The pulsating exhaust gas flow causes the metal exhaust system to vibrate and generate sound waves. By correctly locating the silencer and attaching it to the exhaust system, its mass will dampen these vibrations.

It has been computed that the sound-absorbing Inconel wool must be packed into the Ryan mufflers so that the density of the material will be exactly 25 lb per cu ft. Less than this will not accomplish the job; more than this density will add unnecessary weight. When stainless steel wool was used in this application, it readily burned away due to the extreme heat of the exhaust blast.

• • •

FTC Study Analyzes Mergers Since 1948

A recent study by the Federal Trade Commission shows that although the number of corporate mergers and acquisitions is nearing the post-war peak rates of 1946-47, it is well under the pre-depression rates.

Nearly two-thirds of the acquisitions between 1949 and 1954 involved companies with assets of more than $10 million, FTC notes. Companies with assets of less than $1 million accounted for less than eight per cent of the mergers.

The growing number of mergers within the past few years prompted the FTC study, which covers more than 1500 mergers between 1948 and 1954. The agency noted that while tax savings were not the biggest incentive inspiring the larger number of mergers, they were a factor in such amalgamations as that of Willys.

MUSKEGON

"UNITIZED"

CHROME-PLATED
OIL RINGS

easy-handling

...installs faster than any other multiple-piece ring -and without special installation tooling!

Easy *does* it . . . for saving time and money on the assembly line. And Muskegon helps you do it with the famous "Unitized" Piston Rings. Each ring handles like a one-piece ring, installs faster than any other multiple-piece ring—without special installation tooling.

Now Muskegon offers you *two* "Unitized" oil ring designs! Muskegon's popular CSR-200 chrome-plated ring has the easy handling of a one-piece ring *plus* the fast, error-proof and economical advantages of its "Unitized" construction. The new CSR-400 offers all of these features together with the advantages of a new circumferential expander.

Both designs obsolete other chrome-plated multiple-piece oil rings because only Muskegon's patented "Unitizing" process provides such unique time and money saving benefits. This process holds the pieces together, in the right order during installation, with a special adhesive. The adhesive dissolves completely during the first engine run. The tough, gleaming chrome-plated rails virtually eliminate scuffing, reduce engine rejects, increase oil economy.

Investigate both of these Muskegon rings for your engines. You'll agree nothing can equal them for easy, fast and economical handling. Write us for details today.

CSR-200
First of Muskegon's famous "Unitized" chrome-plated multiple-piece rings . . . proved on America's greatest production lines and in the finest cars. Rails and spacer are correctly pre-assembled and "Unitized" to handle like a one-piece ring

Muskegon's most recent development! CSR-400 chrome-plated oil ring with circumferential expander! All four pieces are "Unitized", a Muskegon exclusive, for easy handling and installation.

MUSKEGON
Piston Rings

Since 1921 The engine builders source!

MUSKEGON PISTON RING CO.
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521 New Center Bldg. Telephone: Trinity 2-2113

Balancing Engine Parts With Portable Vibration Analyzer

THE Seagrave Corp. of Columbus, Ohio, which makes fire trucks "from the ground up," is putting key rotating parts of its engines and pumps through a vibration test, followed, if necessary, by precise balancing at speeds which indicate final performance.

The routine was developed around a portable vibration analyzer. Seagrave production engineers, with the help of the maker of the instrument, developed a test and balancing station where just one operator can perform the work for the entire production line.

The vibration analyzer is not restricted to use at the balancing bench. Various production departments frequently call for it and its operator to perform on-the-spot trouble-shooting and balancing of rotating parts of grinders, lathes, radial drills, and other production machinery. The instrument weighs about 33 lb and can be carried quickly to any point in the plant.

A partial list of parts given routine vibration checks and balancing are the flywheels for the two Seagrave 12-cyl engines, the new 300-hp Model J and the 215-hp Model E; impellers for the engine water pumps; fan drive pulleys; vibration damper assemblies; brake drum assemblies; and pump impellers.

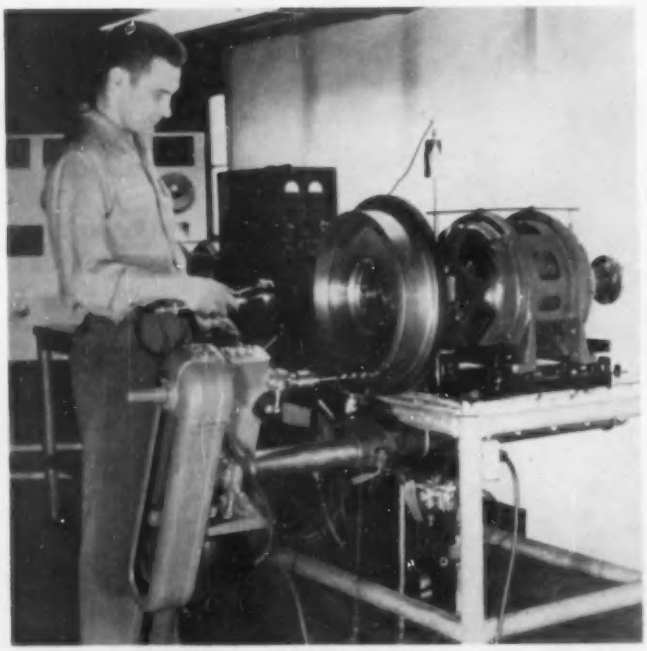
A five-hp electric motor is used to rotate flywheels while a ½-hp motor turns the small high pressure pump impellers. A two-hp and 1½-hp motor make up the rest of the rotating equipment.

The head of a drill press is mounted horizontally so that the operator can quickly drill out excess weight from the flywheels at the point indicated by the vibration analyzer. An air-powered carbide-bit grinder is

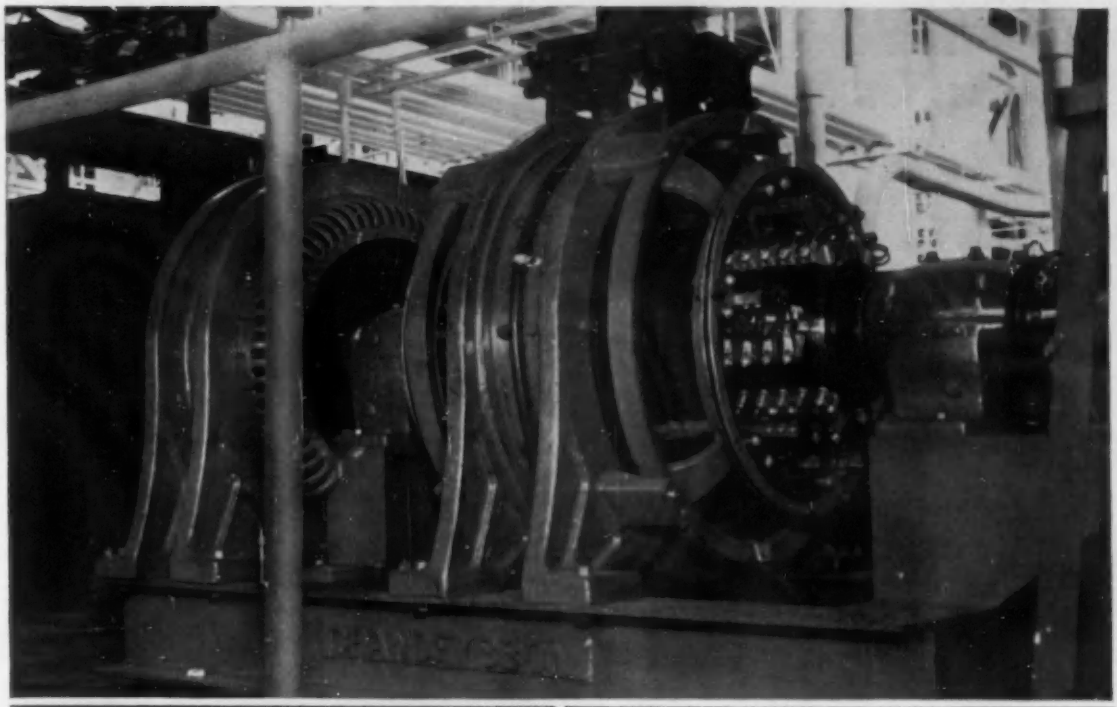
(*Turn to page* 170, *please*)

PARTIAL LIST OF THE BALANCED PARTS

Part	Weight	Maximum Operating rpm
J Engine flywheel	102 lb	2850
E Engine flywheel	46 lb	3850
Volume pump impeller	12 lb 10 oz	4620
High pressure pump impeller	2 lb 10 oz	9350
Fan drive pulley, engine	8 lb 14 oz	2850
Water pump impeller	2 lb 5 oz	7500
Vibration damper assembly	16 lb 3 oz	3850
Brake drum assembly	20 lb 10 oz	3850



Operator preparing to drill out excess weight on the rim of a Seagrave engine flywheel weighing 102 lb after running a quick vibration analysis with a portable electronic instrument. Note the seismic pickup and filtering probe mounted vertically, with the point of the probe resting on the bearing of the arbor. The stroboscopic light in the operator's hand is powered by electrical current generated by the pickup, at the speed of the part being balanced and thus at the same frequency as any vibration caused by unbalance.



INDUSTRY LEADERS CHOOSE

Chandeysson

ELECTROLYTIC GENERATORS

Example:

At PRATT & WHITNEY AIRCRAFT, East Hartford, Connecticut, this Chandeysson Motor Generator is the dependable source of low-voltage power for top-efficiency plating and finishing operations.

MINIMUM MAINTENANCE is one of the benefits that *grow* on Chandeysson users . . . year after year. These rugged motor generators are specifically designed to produce under heavy overloads, to meet all your emergency requirements.

YOU SAVE 4 WAYS...

USE LESS POWER . . . precision-built for efficiency and built-in voltage regulation.

GET MORE OUT OF THE POWER YOU PAY FOR . . . built-in high power factor at no extra cost.

BE SURE OF POWER WHEN YOU NEED IT MOST . . . overload capacity as great as 50% momentarily and 25% sustained, without distress or damage.

ENJOY LIFETIME POWER DIVIDENDS . . . sustained, lifetime overall constant efficiency as high as 85% does not decrease with age or overload.

CHANDEYSSON ELECTRIC COMPANY
4070 Bingham Avenue • St. Louis 16, Missouri

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CHA-54

Three-Year Ford Pact With UAW-CIO Marks New Step in Labor Relations

By Leonard Westrate

Other automobile companies and suppliers in the automotive industries now have some indication of what they face in forthcoming labor negotiations as a result of Ford's settlement with the UAW-CIO recently.

Unemployment Benefits Won

Most important provision of the Ford agreement is a supplemental employment benefit plan. It does not represent a "guaranteed annual wage" actually, but it does embrace the principle of company responsibility for the continued income of workers laid off through their no fault of their own. Most significant factor in the plan finally agreed upon is that it has a definite limited liability and is financed by a predictable amount per hour paid into the fund.

Whether or not the union will employ its customary pattern technique to smaller companies in an attempt to gain all benefits it won from Ford still is not known. It is almost certain, however, that the unemployment benefit plan will become a basic demand at all companies with which the UAW-CIO negotiates this year.

Wage Adjustments Made

No general across-the-board wage increase was granted, but adjustments ranging from six to 17 cents per hour were made in some highly skilled classifications. Ford declined to estimate the cost of the contract gains, but the union fixed it at 20 cents per hour. The length of the contract—three years—was a compromise between the company's desire for a five-year term and the union's demand for a two-year maximum.

Portent for the Future

While the principle of limited liability answers much of the criticism leveled against the guaranteed annual wage, acceptance of the principle of company responsibility admittedly was a notable gain for the union. Realists in the industry seem convinced that the Ford settlement is "a foot in the door" and that at the end of the three-year contract, the union will again be back seeking increased levels of payments and longer duration of benefit coverage.

Contract Alterations

Several major changes were made in the Ford contract. These include a higher annual improvement factor, a liberalized pension plan, a broader vacation program, an additional paid holiday, improvements in the cost-of-living escalator clause, triple pay for holidays worked for most employes, increased employe insurance, and, as mentioned above, wage increases for workers in certain skilled classifications.

Details of Layoff Payments

The unemployment compensation program falls far short of the union's original goal of full pay for 50 weeks. Briefly, it provides a maximum of 65 per cent of the employe's weekly pay after taxes for a maximum of 26 weeks. The 65 per cent level applies only to the first four weeks of payments, which start after a lapse of one week from date of unemployment, and drops to 60 per cent thereafter. Company contributions will be a maximum of $25, and the balance will come from state unemployment compensation.

Financing of Benefits

The plan will be financed exclusively through payments of five cents an hour per employe during the next three years. At current payrolls, maximum funding would amount to about $55 million. First payments may be made from the fund starting one year from the date of the contract.

Credit Accumulations

Qualifications for payments are based on a complex system of credits earned for each work week of 32 hours or more. During the first two years, employes will earn one-quarter credit for each week worked and one-half credit for each week starting June, 1957. Maximum credits an employe could accumulate is 26.

Ratio of credits to weekly benefits is determined by the amount of money in the trust fund as a percentage of the maximum fund and also by seniority. When the trust fund position is 85 per cent of the maximum, all eligible employes receive one weekly credit for one credit unit. When the fund is below that level, ratio of credits to weekly benefits is based on seniority within specified brackets.

Weekly Payments Vary

Amounts of weekly benefits are variable, according to individual earnings of employes and state unemployment compensation provisions. Administrative changes in unemployment compensation provisions will be required in states where Ford has plants. These are expected to be accomplished without any appreciable difficulties.

Improved Allowances

The new contract increases cost-of-living allowances by nearly 17 per cent. The allowance, whenever more than six cents, now goes up one cent an hour every time the cost-of-living index increases one-half (0.5) of a point. The old contract provided a one-cent increase each time the index went up three-fifths (0.6) of a point.

Under the new agreement, the minimum annual improvement increase will be six cents an hour or 2½ per cent of base pay, whichever is greater. Under the old contract, the factor was five cents an hour.

Pensions Enlarged

Pensions have also been liberalized. Retirement benefits will be figured at the rate of $2.25 for each year of credited service, instead of at the rate of $1.75. Furthermore, a 30-year maximum on service used for computing benefits has been eliminated. The disability benefit rate has been increased to $4.50 from $3 for each year of service, and the age of 50 eligibility requirement has been removed. For the first time, employes will have specified vested rights in the pension plan if they terminate active employment after age 40 and have at least 10 years of service.

Miscellaneous Benefits

A seventh paid holiday is included for the first time in the new agreement. Employes who work any of the holidays specified in the agreement will be paid regular pay, plus double time, or triple wages.

Insurance plan provisions have also been improved in seven specific categories. Most important is provision for including wives and children of eligible employes under in-hospital medical benefits.

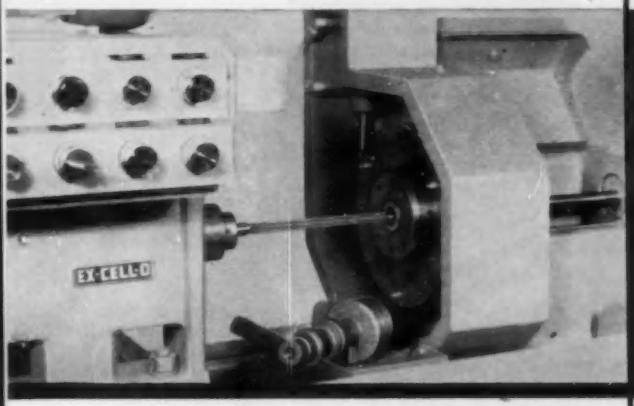
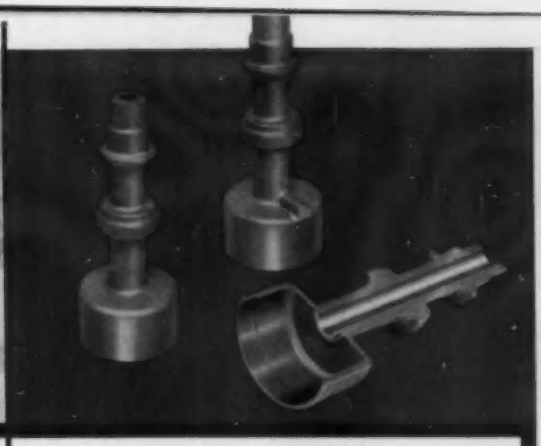


Photo with guards removed shows drill about to enter the guide bushing in the center of the chuck. Coolant oil under high pressure is directed through the spindle and drill, washing chips out of the single flute.



On this cast-iron distributor base, holes are machined straight and round within .0005"; diameter is also held within .0005"; finish does not exceed 15 rms. The hole is completed from start to finish in 30 seconds.

XLO

EX-CELL-O for PRECISION

Today's method by EX-CELL-O for reducing your costs

BOR-DRIL

for straight, accurate holes from solid with good finish—on standard machines

TOOL SHOW CHICAGO, ILL.

Equipped to Bor-Dril is this standard Style 2112-A, the smallest single-end model in the Ex-Cell-O Precision Boring Machine line. These machines are rigid, have easily adjustable feeds, vibration-free spindles. Multiple spindle applications for high production.

For more information on Bor-Dril, or for a quotation on a machine equipped for this work, call in your local Ex-Cell-O Representative or contact Ex-Cell-O in Detroit.

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DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

55-16

AI TABLOID

(*Continued from page 37*)

Ford Motor Co. has released a new motion picture entitled "Test Driver." . . . American Pullmax Co. has available a new film on its line of sheet and plate working machines. . . . Nash Motors has produced a new series of films on its products for theatre use.

* * *

Marshall, Sons and Co., Ltd., will produce a new British wheeled tractor powered by a 70-hp Leyland Diesel engine.

* * *

The first Thunderbird, assembled in Mexico, came off the production line at the Mexico City Ford plant in May. This is the first of 48 similar cars to be produced in Mexico this year.

* * *

Detroit Stamping Co. celebrated its fortieth anniversary recently.

* * *

Claud S. Gordon Co., Chicago, announces completion of addition to its plant at Richmond, Ill., to double its manufacturing facilities.

* * *

The de Havilland Engine Co., Ltd., has announced a new liquipropellant rocket motor, the Spectre.

* * *

Curtiss-Wright Corp. has acquired sites for an emergency jet engine assembly plant in the mountains of Pennsylvania and for headquarters and research facilities in northern New Jersey. They would be used in the event its metropolitan area plants should be wiped out.

* * *

Aluminum Industries, Inc., is planning a $1 million plant modernization and expansion program.

* * *

Pullman Vacuum Cleaner Corp. has purchased Electric Blower Co. . . . American Pulley Co. has bought the assets of Safety Industrial Equipment Corp.

* * *

Janitrol Aircraft - Automotive Div. of Surface Combustion Corp. has developed a device that is said to enable aircraft engines to start in three minutes in the coldest weather.

(*Turn to page 186, please*)

Axelson Mfg. Co.—Edward D. Jackson has been named general sales manager.

MEN *in the* NEWS

(*Continued from page 41*)

Mercury Div., Ford Motor Co.—**A. H. Crowley** has been appointed assistant general sales manager in charge of field operations.

National Screw & Mfg. Co.—**Howard L. Hopkins** is now chief engineer; **Albert J. Parker,** chief products engineer; **Price Berrien,** works manager; **H. Robinson Hyde,** director of sales research; and **Clayton J. Cross,** production manager.

Mechanics Universal Joint Div., Borg-Warner Corp.—**Arch A. Warner** has retired as president.

Ryan Aeronautical Co.—**Frank W. Fink** is now vice-president and chief engineer.

Chrysler Corp. of Canada—**Frank J. Hogan** has been appointed vice-president in charge of finance.

Studebaker Div., Studebaker-Packard Corp.—**Peter S. Barno** has been appointed director of industrial relations, and **Harry D. Beutlich** has been named labor relations manager.

White Truck Div., White Motor Co.—**Joseph E. Adams** is now general manufacturing manager.

Clark Equipment Co.—**C. H. King** and **D. H. Ross** have been elected directors.

Willys Motors, Inc.—**Sam F. Green** has been appointed manager of special equipment and specialty vehicles.

(*Turn to page 182, please*)

Cincinnati Milling & Grinding Machine, Inc.—E. D. Vancil and Alfred T. Blackburn have been elected vice-presidents and directors.

Industry News

(*Continued from page 39*)

Alcoa Survey Demonstrates Aluminum Automotive Uses

Aluminum used on the average passenger car has zoomed to a high of almost 30 lb on 1955 models, according to a survey recently completed by Aluminum Co. of America.

The company predicts that each car should use over 100 lb of the light metal by 1970.

While the average of 29.6 lb is a relatively small proportion of the total weight of a car, Alcoa states that this use of aluminum will consume over 178 million lb of the metal, even if only an original estimate of six million automobiles should be produced this year. Current production, of course, is running much ahead of this figure. A further estimate by Alcoa automotive development engineers indicates that 262 lb of aluminum could be feasibly used on a standard automobile.

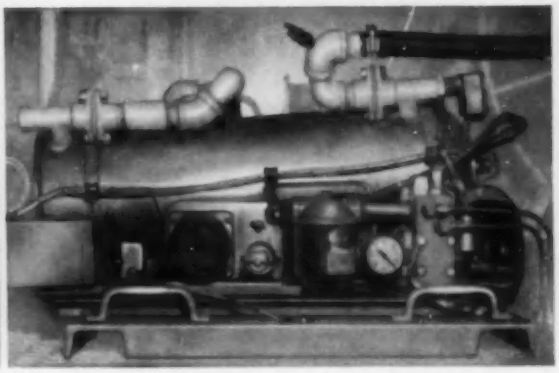
The Alcoa survey showed that the heaviest uses of aluminum on 1955 passenger cars were in automatic transmission parts and engine components. Automotive trim and hardware reportedly is the application for aluminum in cars which shows most promise for growth during the next few years.

Automotive designers are also said to be taking increasing advantage of the decorative design features offered by aluminum. Another field where interest in aluminum has heightened concerns its use in automotive radiators.

GM "Powerama" To Open In Chicago on Aug. 31

A huge outdoor exposition, combining for the first time all Diesel and turbine-powered equipment made by General Motors Corp., will be staged on Chicago's lakefront from Aug. 31 through Sept. 25. Called the General Motors Powerama, the show will feature exhibits depicting actual operations of a modern locomotive, saw mill, cotton gin, earth mover, oil drilling rig, and other power equipment.

In addition, the spectacle, which will take up one million sq ft of area near Soldier's Field, will feature an F-89 Scorpion fighter plane, an M-48 tank, submarine, and other marine equipment and craft. Seven of GM's cars of the future and a "dream truck" will be displayed.



TYPE 0-6 CRASH TRUCK plus JANITROL LIQUID HEATER equals

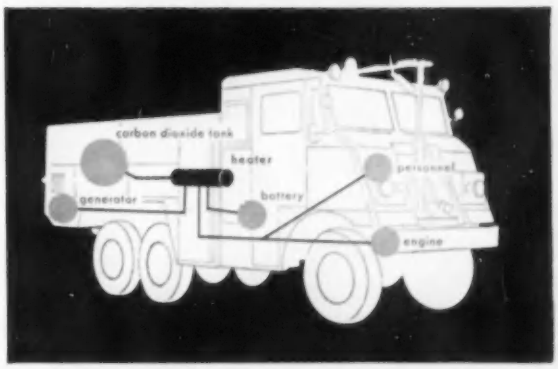
WINTERIZATION TO 65° BELOW ZERO

It takes just fifteen minutes for two men to install and connect, or disconnect and remove the Janitrol Liquid Heater equipped "winterization kit" in the Air Forces new Type 0-6 Cardox Crash Truck.

Cardox engineers took full advantage of Janitrol unit design accessibility . . . added a coolant pump, hand bypass pump, electrical over-ride connections, and an aluminum channel-iron skid base to come up with the ultimate in changeover speed. Just six quick-disconnect couplings tie coolant flow—electric supply—and fuel supply to the permanently installed winterization system within the truck. Operating controls are installed in the truck cab.

The Janitrol heater provides 90,000 Btu/hr for engine block, engine pan, battery box, radiator, cab and body, defrosting, a motor generator set, and the Cardox pressure vessel heating. Complete insurance against winter operating failures caused by freeze-ups!

Look into Janitrol Liquid Heaters' long record of dependability under all conditions—and you'll specify "Janitrol" for vehicle heat wherever and whenever needed.

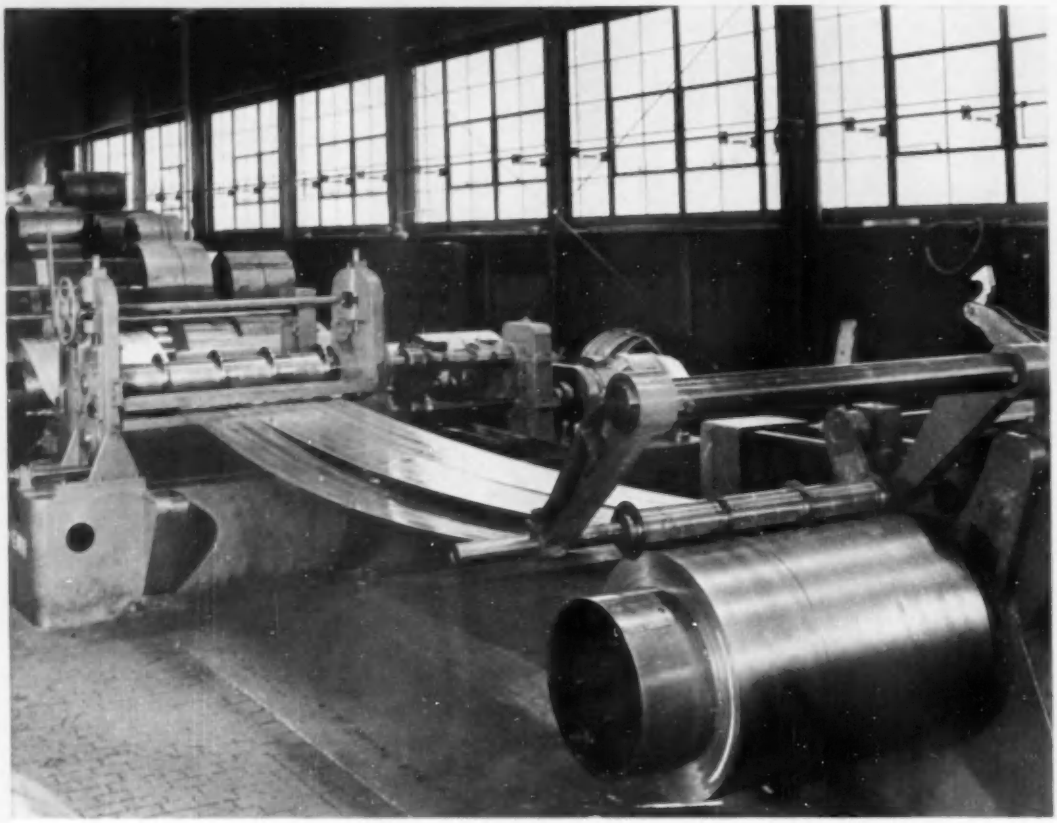


HEAT WHEREVER YOU WANT IT

Janitrol

AIRCRAFT-AUTOMOTIVE DIVISION, SURFACE COMBUSTION CORP., COLUMBUS 16, OHIO

District Engineering Offices: New York, 225 Broadway; Washington, D. C., 4650 East-West Highway; Philadelphia, Penna., 401 No. Broad St.; Kansas City, Mo., 2201 Grand Ave.; Fort Worth, 2509 Berry St.; Hollywood, Calif., 7046 Hollywood Blvd.; Columbus, Ohio, 400 Dublin Ave.

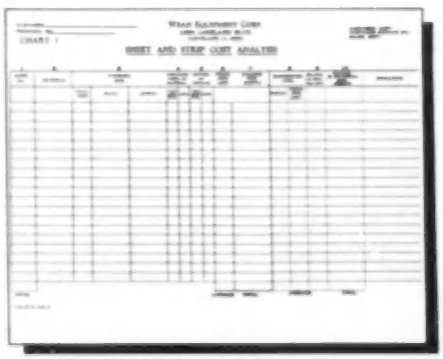


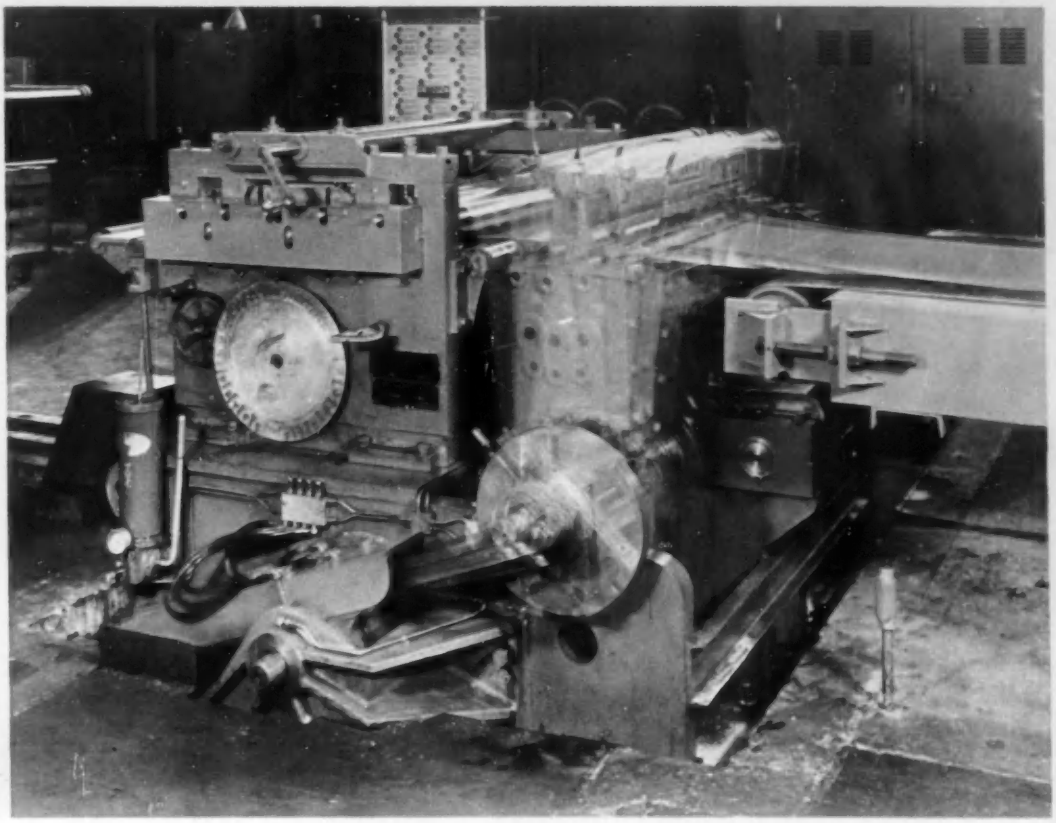
HERE'S HOW The WEAN Can Save You 20%

And

Here's A Simple Test That May Startle You

Want to save 20 percent on your steel costs? If you are using sheet steel in any great amounts a Wean Equipment engineer can quickly show you how the amazing new Wean Slitting and Flying Shear Line can effect this savings in your plant. Using your actual figures, Wean can, by a simple comparison method, quickly prove to you that these savings are possible. Why continue operating at high costs when this improved method could be saving you as much as $20 a ton on your steel?





Slitting and Flying Shear Line On Your Steel Costs

The secret of these tremendous savings is a short cut in getting steel from coil form to fabrication. If you are not one of those already using the Wean Slitting and Flying Shear Line you are either paying mill extras for shearing to tolerance and size or are forced to do this operation expensively and slowly in your own plant or a costly combination of both.

The Wean Slitting and Flying Shear System eliminates this entire processing function by converting steel from coil to production size, at resquared tolerances, at a rate of 100 cuts per minute.

Just figure it out for yourself. Apply these figures to your own operation. Total up the extras you are now paying for steel preparation and you'll see why it will pay you to talk with Wean.

Wean

COMBINATION SLITTING and SHEARING SYSTEMS

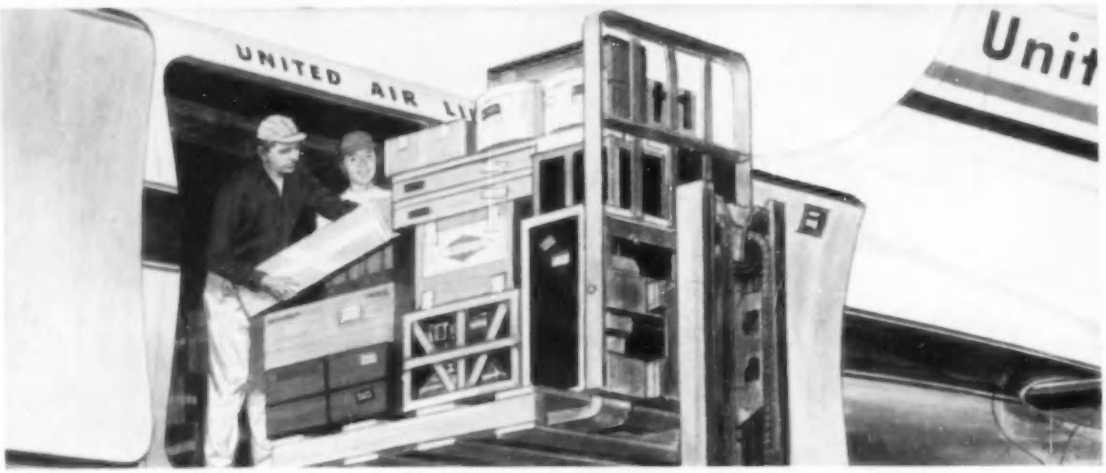
WEAN EQUIPMENT CORPORATION OFFICES

Cleveland

Chicago Newark N. J. Detroit

Cable Address: Weancor

"How do you keep production so steady?"



One reason: United Air Lines Air Freight

In order to maintain tight control over production schedules and prevent costly pile-ups of surplus material, many manufacturers now include fast, dependable United Air Lines Air Freight in their regular day-in, day-out operation. In this way production can be closely related to sales and inventory control, and the subsequent close timing pays off in real economy.

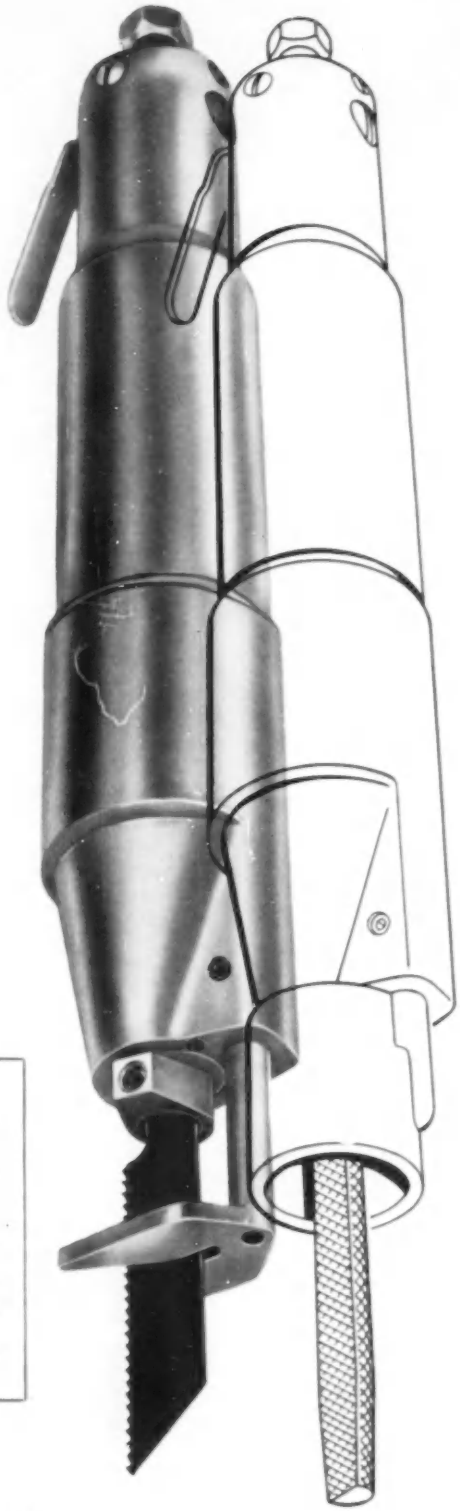
The most convenient way to make the most of air freight is to use United's Reserved Space Air Freight plan—which only United offers on all equipment. Reserved Air Freight moves on most of United's 254 daily Mainliner® flights and is offered after consideration of mail and express needs. Ask your nearest United office about its distinctive advantages. Or write for new booklet, "Industry's Flying Partner": United Air Lines, Cargo Sales Dept. I-6, 5959 S. Cicero Ave., Chicago 38, Illinois.

New world-wide Reserved Space Air Freight service available to 84 countries

Bright as tomorrow!–Right for the years!
SUPERIOR
stainless strip steel
The sparkle that catches the car buyer's eye is a *permanent* pleasure with Superior Stainless. Time can't dull the brightwork made of this solid-bright metal. Superior Stainless Strip Steel is the dress-up feature that helps make the sale —and through superior performance, helps keep each owner sold. • Let us give you the facts on fabricating ease, gauges, tempers, finishes and coil widths for your needs.
Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

NEW!

the double-duty CP Air Saw



IT CUTS AND FILES . . .

Stainless Steel, Dural Alloys, Nickel, Copper, Aluminum, Iron, Steel, Brass, Plastics, Plexiglass, Fiberglass, Porcelain, Formica, Corrugated Transite Sheeting, Wood, Plywood, Hard Fibre, Wall Board, Masonite.

The CP Air Saw is not an attachment . . . it's a heavy-duty production tool that can take standard blades and files. The Chicago Pneumatic Saw has CONTROLLABLE POWER . . . a built-in speed regulator enables you to select the right speed for every specific work condition. When fitted with the blade collet it can saw practically every material and cut most any possible shape . . . a file chuck can be added to power bench files having round or flat shanks. *Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.*

EXAMPLES OF ITS THOUSAND-AND-ONE USES

1. **In Receiving and Shipping** — for opening wooden boxes and crates.
2. **In the Shop** — for cutting through thin gauge metal without resulting warpage.
3. **In the Foundry** — for deburring castings.
4. **In the Automotive field** — for installing car heaters, radios and many other "extra" items.
5. **In the Electrical field** — for armature undercutting, cutting coils out of electric motors prior to rewinding, for filing burrs from stator slots in motors and generators.
6. **In Plant Maintenance Departments** — for blind sawing in duct and piping work.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

CALENDAR

OF COMING SHOWS AND MEETINGS

ASME Semi-Annual Meeting, Hotel Statler, Boston, Mass. ....June 20-23

ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 26-July 1

American Nuclear Society, first annual meeting, Penna. State Univ., State College, Pa....June 27-29

Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif. July 12-14

SAE Golden Anniversary West Coast Meeting, Hotel Multnomah, Portland, Ore. .....Aug. 15-17

NICB Symposium on Electronics and Automatic Production, San Francisco, Calif. .....Aug. 22-23

Western Electronic Show and Convention, Civic Auditorium and Fairmont Hotel, San Francisco, Calif. .....Aug. 24-26

General Motors Powerama, South Lake Shore Drive, Chicago, Ill. .....Aug. 31-Sept. 25

National Aircraft Show, International Airport, Phila., Pa. ...Sept. 3-5

Farnborough Air Show, England Sept. 5-11

Paris Automobile Show, France Sept. 6-16

NMTBA Machine Tool Show, International Amphitheater, Chicago, Ill. .....Sept. 6-17

Production Engineering Show, Navy Pier, Chicago, Ill. .....Sept. 6-17

Coliseum Machinery Show, Chicago, Ill. .....Sept. 6-17

SAE Golden Anniversary Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. .....Sept. 12-15

Instrument Society of America, 10th annual Instrument-Automation Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. .....Sept. 12-16

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 14-16

National Industrial Packaging and Materials Handling Show, Kingsbridge Armory, New York, N. Y. Sept. 20-22

First Trade Fair of the Atomic Industry, Sheraton-Park Hotel, Washington, D. C. .....Sept. 26-30

AIEE Fall General Meeting, Hotel Morrison, Chicago, Ill. .....Oct. 3-7

World Plastics Fair and Trade Exposition, National Guard Armory, Los Angeles, Calif...Oct. 5-9

SAE Golden Anniversary Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif..Oct. 11-15

National Metal Exposition, Convention Hall, Philadelphia, Pa. Oct. 17-21

International Motor Show, Earls Court, London, England...Oct. 19-29

Institute of Traffic Engineers, silver anniversary meeting, William Penn Hotel, Pittsburgh, Pa..Oct. 23-27

Canadian Industrial Tool and Equipment Show, Montreal, Canada .....Oct. 24-28

ASME-IME Joint Conference on Combustion, London, England Oct. 25-27

Automobile Old Timers, 16th anniversary dinner, Waldorf-Astoria Hotel, New York, N. Y.. Oct. 28

SAE Golden Anniversary National Transportation Meeting, Hotel Chase, St. Louis, Mo...Oct. 31-Nov. 2

Specify *Michigan* Tubing for Automobile Parts

This gasoline tank filler tube has the overflow pipe brazed to the filler tube at two points and the fastener clamps projection welded to the tube. The cam is spot welded to the tube mouth.

Ready for the automobile assembly line is this steering jacket, a vital volume produced tubular part of a major control unit, manufactured by Michigan.

The muffler inlet pipe above shows how Michigan workmanship performs several intricate fabricating operations to most exacting tolerances.

Fabrication by Michigan of this horn tube, which has a diameter variation of ±1 per cent, is another example of the workability of Michigan tubing and of Michigan engineering competence.

ROUND

¼" to 4" O.D. 7 to 22 gauge

SQUARE	Gauge	RECTANGULAR
⅜" to ⅝"	16 thru 22	⅜" minimum side to 5" maximum side
⅝" to 1"	11 thru 22	
1" to 2"	11 thru 20	
2" to 3"	11 thru 18	

Carbon 1010 to 1025

For almost 40 years

Michigan has been manufacturing tubular parts for leading automobile manufacturers. This acceptance of Michigan tubing has been won by meticulous attention to customer requirements and the supplying of the very best in tubing. The following advantages of low cost manufacture and utmost dependability are yours when you specify Michigan for tubular parts in the fabrication of automotive vehicles:

1. It is fabricated in round, square and rectangular shapes, in a wide range of sizes;
2. It is always of uniform strength, weight, ductility and weldability;
3. It can be flanged, expanded, tapered, swaged, beaded, upset, flattened, forged, spun closed, fluted and rolled.
4. It can be formed or machined in your plant or prefabricated at Michigan.

Consult Michigan

for engineering and technical help in the selection of tubing best suited to your needs.

RESISTANCE WELDED STEEL TUBING

Michigan STEEL TUBE PRODUCTS CO.

THE OLDEST NAME IN ELECTRIC

Nearly 40 Years in the Business

9450 BUFFALO ST. • DETROIT 12, MICH.

FACTORIES: DETROIT, MICHIGAN • SHELBY, OHIO

DISTRIBUTORS: Steel Sales Corp., Chicago, St. Louis, Milwaukee, Indianapolis and Minneapolis —Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland Co., Dayton, Ohio—Service Steel Co., Los Angeles, Calif.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—Globe Supply Co., Denver, Colorado—W. A. McMichaels Co., Upper Darby, Pa.—A. J. Fitzgibbons Co., Buffalo, N. Y.—C. I. Crais Co., Birmingham, Ala.

Off-the-Highway Vehicle Industry

(*Continued from page 67*)

Other special-purpose machines distribute ballast, tamp ties, clean yards, shift tracks, grind rails, spray weeds, etc., while inspection, section, and gang cars carry maintenance personnel and their tools over the miles of steel rails to repair sites. Powered by gasoline or Diesel engines, these specialized types of work equipment, such as track liners—with which two men can do the same amount of work as 10 to 16 men using lining bars—have been extremely instrumental in enabling the railroads to hold their own against constantly rising operating costs.

MINING

Mechanization, with its attendant increase in productivity, has been U. S. mining's answer to rising costs. Each new piece of equipment has multiplied the miner's ability to produce more tons per man-hour. The increase in individual output has enabled U. S. mining to pay top wages and maintain its lead as the world's most efficient mining industry.

The present trend in strip and open pit mining equipment is to larger units. This is true also in underground mining equipment, although the size there is limited by the size of the opening which it is safe to make underground. If our population continues to grow at its present rate, the U. S. economy will require vast increases in the amounts of raw materials and energy in the future. These requirements will result in even more intensive mechanization of our mines and increase the demands for all types of mechanical mining equipment.

Above-Ground Equipment

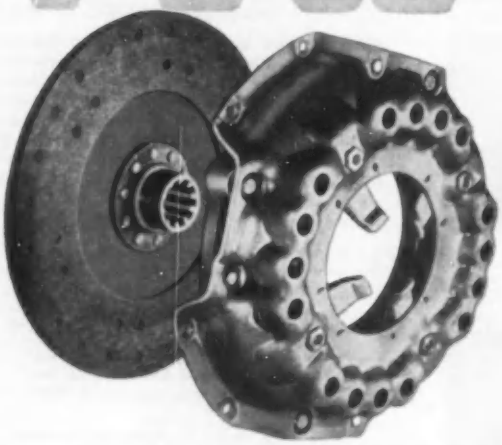
It is in open-pit and strip mining operations that modern construction machinery, as was pointed out in the first section of this article, plays an important role. Power shovels, draglines, continuous bucket loaders, and other modern excavating machines are actively at work in and around surface mining operations.

Opening of a pit mine today presents a busy scene. Bulldozers and scrapers carve roads and push away trees, rocks and earth; portable repair shops move in on trailers; big power shovels scoop out as much as 60 cu yd in a single giant bite, and the ore rolls out on rugged 10-wheel dump trucks as big as railroad cars. When mining operations are finished, modern methods and equipment restore the disturbed area. The land is reforested or suitable crops are planted, and Mother Nature is aided in every way to produce anew.

It is interesting to note, that as late as 1937, there were few, if any, trucks used in open pit mining operations. Today, however, to take just one example, more than 1000 specially built, heavy-duty units operate in the fabulous Mesabi Iron Range of Northern Minnesota.

Underground Equipment

The extent to which mechanization has taken hold in underground mining operations is shown by the fact that in 1954 about 82 per cent of the underground output of coal was mechanically loaded. This was accomplished with the aid of such machines as mobile cutters and continuous mining units feeding the loaders. Aiding in the operations were many other mechanized units



BORG AND BECK
TYPE "E" CLUTCH

- Husky—Heavy Duty
- "Strap Drive"
- Friction-Free
- Smooth Engagement
- Minimum Maintenance

Engineered by BORG & BECK
for that vital spot where power takes hold of the load

ENGINEERING B-W PRODUCTION

BORG & BECK DIVISION
BORG-WARNER CORPORATION • CHICAGO 38, ILLINOIS

How we opened the door to lower costs for Ford

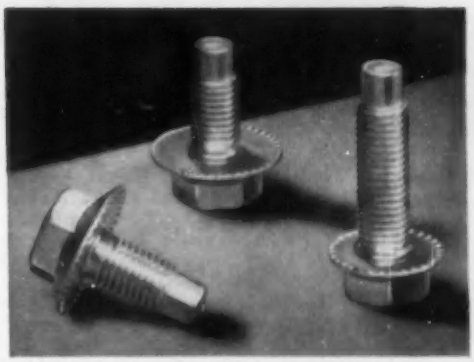
Two hinges on every Ford door. Six screws and 12 washers for each hinge.

Did this present an opportunity for cost reduction? An RB&W "fastener engineer" thought so. And after careful analysis and time studies Ford engineers agreed.

The solution: RB&W Hex SPIN-LOCK screws to fasten the hinge to the door, eliminating the need for washers. And special wide-flange Hex SPIN-LOCK screws for attaching the hinge to the frame, doing away with more washers. The wide flange is necessary to cover an elongated hole in which the hinge moves to permit accurate alignment.

Result — parts requirements are cut by two thirds, assembly is simplified, purchasing and inventory costs are lowered. And RB&W SPIN-LOCK screws hold those door hinges tight for good.

We will be glad to send an RB&W man around to check up on your fastening operations. Every problem is different, of course, but RB&W has a fastener for just about every job. If you need a "special", as Ford did, we'll design and make it for you. Write RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, New York.



FASTER ASSEMBLY, reduced costs were the pay-off, using RB&W designed wide-flange SPIN-LOCK screws (left) for door hinge. Other SPIN-LOCKS (right) hold hinge on door. SPIN-LOCK screws *can't loosen* because ratchet-like teeth lock into surface and hold tight.

3.10

RB&W

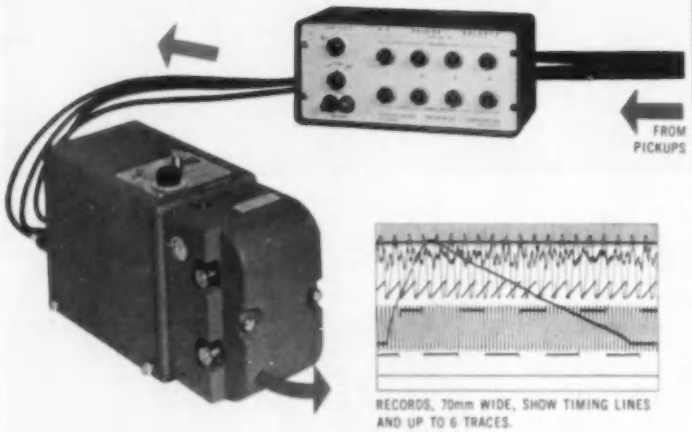
109 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N.Y.; CORAOPOLIS, PA.; ROCK FALLS, ILL.; LOS ANGELES, CALIF. *Additional sales offices at:* ARDMORE (PHILA.), PA.; PITTSBURGH; DETROIT; CHICAGO; DALLAS; SAN FRANCISCO. *Sales agents at:* SEATTLE. *Distributors from coast to coast.*

To test your product dynamically...

here's a new high in flexibility... a new low in cost

This simplified, low-cost test equipment should be in every engineering department. It fills the long-standing gap between pen-type recorders and complex oscillograph/amplifier systems... provides a high-speed graphic record of the physical conditions that affect the life of your product. Stress, strain, pressure, vibration, temperature... you can measure them all *at the same time*. And these small, lightweight instruments can be carried anywhere... little experience is required for their operation.



RECORDS, 70mm WIDE, SHOW TIMING LINES AND UP TO 6 TRACES.

5-117 RECORDING OSCILLOGRAPH ... records up to 6 channels of data *without amplifiers* at frequencies to 200 cps (with amplifiers, to 3000 cps). Uses 70-mm by 100-ft paper or film, driven ¾" to 24"/sec. Timing lines appear every 1/100 second. Bulletin CEC 1533A-X 7.

5-118 STRAIN-GAGE BRIDGE BALANCE ... 4-channel control link between oscillograph and strain gages or resistance-type pickups. Has controls for balancing and adjusting d-c voltage across each channel and provision for calibration resistor. Send for Bulletin CEC 1560-X 2.

Consolidated Engineering
Corporation

ELECTRONIC INSTRUMENTS FOR MEASUREMENT AND CONTROL

300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service Offices Located in: Albuquerque, Atlanta, Boston, Buffalo, Chicago, Dallas, Detroit, New York, Pasadena, Philadelphia, San Francisco, Seattle, Washington, D. C.

such as timber setters, mine air compressors, roof bolting drills, etc.

Transportation of ore, timber, men, and supplies on the surface and underground poses one of the most important problems in modern mining. Radical changes in direction of flow add to the complexity of the matter and often necessitate the use of several methods of transportation in bringing ore from the face to the shipping point.

Electric locomotives generally are a favored form of underground horizontal transportation in mines of 500 tons or more output a day. As a rule, coal mines have only one horizontal working level, but metal mines may have several.

Battery-powered, electric cable, and Diesel-electric shuttle cars are other popular forms of transportation in modern mining operations. In 1953, for example, there were 4222 shuttle cars in service in bituminous coal and lignite mines alone.

PETROLEUM

Oil producers are vitally dependent upon automotive equipment in all three phases of petroleum operations —exploration, drilling, and production. Even small operators must maintain several trucks and passenger cars, and large operators maintain fleets of trucks, cars, and tractors, many of them equipped for special oil field services. While accurate statistics are not available, it is estimated that oil companies have at least $250 million invested in automotive equipment and that the recurrent annual replacement expenditure exceeds $100 million, including tires and other accessories.

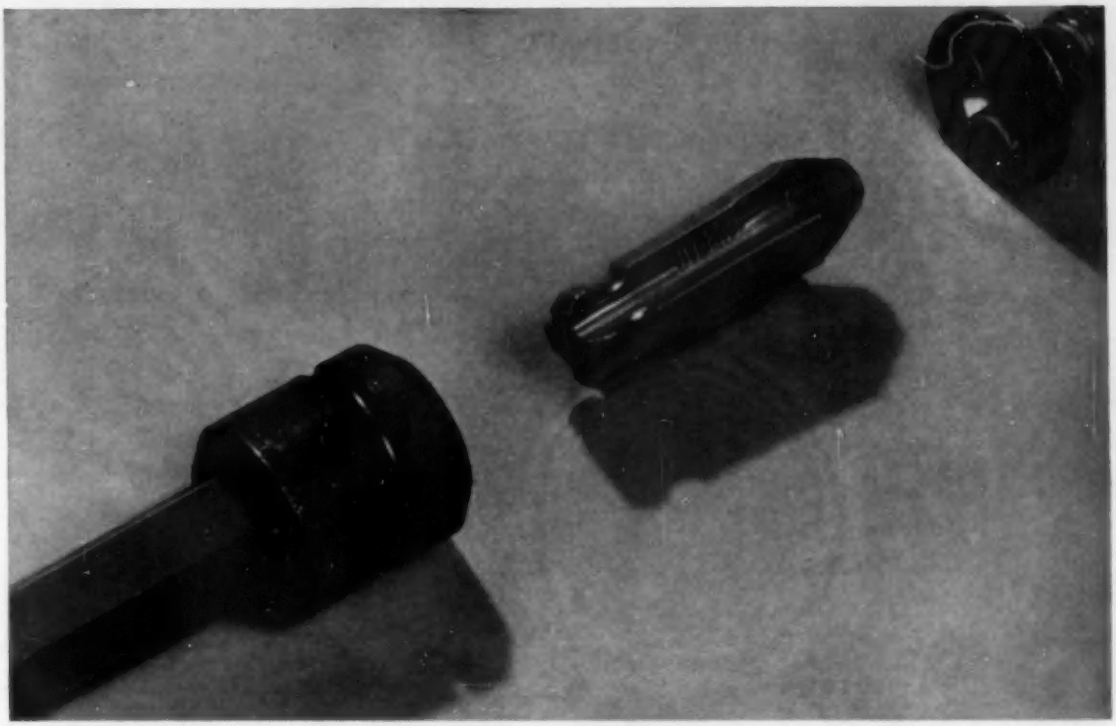
Exploration

Equipment and manpower used for exploration purposes involve sizeable expenditures. U. S. seismograph crews, which average 12 men each, travel the equivalent of 428,000 miles a year in the never-ending quest for new sources of oil. Along with them goes such automotive equipment as recording trucks, water-tank trucks, pickup trucks, dynamite trucks, recording trucks, etc.

In addition to the foregoing, highly specialized self-propelled vehicles, such as marsh buggies and bog tractors, are used extensively in survey work. They find particular use in areas where the terrain is difficult to navigate in ordinary vehicles, and they enable geophysicists to seek out what may be rich deposits of oil in otherwise nearly inaccessible locations.

(*Turn to page* 120, *please*)

YOU CAN COUNT ON CONTINENTAL FOR EVERY FASTENER NEED!



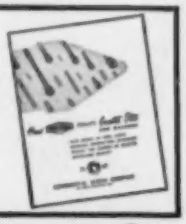
Phillips "*Bits–Holders–Screws*" are Exclusive with Continental!

Here's how they can boost your output

Only the Continental Screw Co. offers this three-way fastening combination to increase your output. Phillips *bits, holders, and screws* now make power-driving really practical—even on your finished parts.

The Continental record speaks for itself. Continental Phillips Bits have driven as many as 1,000,000 screws without replacement. They average from 2 to 4 times longer life than other bits, and have cut fastening costs as much as 50%.

Send for this free booklet on Hy-Pro Phillips Insert Bits and Holders. Write to Continental Screw Co. New Bedford, Mass.



Continental Screw Co.

Manufacturers of Holtite Fastenings

NEW BEDFORD, MASSACHUSETTS, U. S. A.

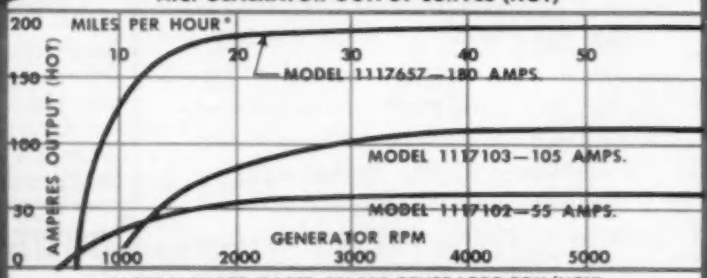
Progressive Engineering

A.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117102	12	525	39	55	825	All speeds.
1117103	12	960	5	105	1575	All speeds.
1117657	12	550	130	180	2700	All speeds.
1117062-3-4	6	750	38	90	720	All speeds.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

A.C. GENERATOR OUTPUT CURVES (HOT)



*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

Makes the Difference

DELCO-REMY'S NEW A.C. GENERATORS ANSWER THE WIDE VARIETY OF NEEDS IN HEAVY-DUTY APPLICATIONS

The electric power demands of modern buses, fire trucks and similar vehicles are heavy, continuous, and varied —ranging from alternating current for fluorescent lighting to direct current for other electrical equipment. The supply problem is further complicated by long and frequent periods of engine idling. But here's the answer to these problems—Delco-Remy's 6- and 12-volt A.C. generators, designed specifically for vehicles with extra-heavy electrical loads.

The features of these new generators are many and impressive. Performance-wise, their characteristics include cut-in at low generator rpm, maximum output at low speeds, and the ability to operate at maximum efficiency over a wide speed range. Structurally, they are extremely low in weight in proportion to their tremendous output.

These new special-purpose generators are another example of Delco-Remy leadership in the automotive electrical field. Specify Delco-Remy electrical equipment for your new heavy-duty vehicles.

Delco-Remy
ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Off-the-Highway Vehicle Industry

(*Continued from page* 116)

Drilling

There are two common methods of drilling for oil—the cable-tool and the rotary drill. While drilling rigs are frequently mounted on special trucks for shallow operations, it is in oil well maintenance that automotive vehicles find their greatest usage.

It is estimated that 50,000 new wells, approximately 206 million ft of hole, were drilled in 1954. These new wells, plus the 501,859 producing oil wells in the U. S. at the end of 1953, currently provide a basic operable capacity of 8.5 million barrels a day. Keeping these wells in operation requires hundreds of truck-mounted well servicing rigs, gang trucks, mechanic's trucks, pressure testing trucks, and the like. An interesting corollary lies in the estimate that there are 250,000 engines of all types employed in oil well services for an aggregate power output of 10 million hp.

Production

As has already been noted in the first section of this article, mobile construction machinery plays a fundamental role in petroleum production operations. Bulldozers clear access roads to wells, draglines and other excavating equipment dig trenches for pipelines, while cranes lay pipe for bringing the oil from the source to the distribution point.

The most important vehicle in the oil production chain and its final link is the tank truck. Forerunners of today's tank trucks were the horse-drawn wagons used in the early 1900's. These wagons were generally limited to local distribution and usually ranged in capacity from 500 to 1500 gallons. In the early 1930's, large bulk trucks and trailers with capacities up to 5000 gallons were introduced.

Thus, pipe line plus truck, or barge plus truck, offer attractive transportation economies in the petroleum industry today. Tank trucks carry products to local bulk stations, deliver gasoline and Diesel fuel to service stations and farms, and bring heating oil and LPG to millions of U. S. homes.

OTHER FIELDS

In addition to the foregoing industries, special automotive-type vehicles are used in a number of other fields for a variety of diverse applications. Listed below are those most commonly employed in air transport and external materials handling operations, plus a brief account of the development and current widespread usage of self-propelled power mowers.

Air Transport

The successful operation of an airport and its facilities is dependent to a large extent upon a specialized group of automotive-type vehicles. Broadly classified as ground equipment, this group includes such units as: tow tractors for moving planes from one area to another or for hauling baggage carts; self-propelled air conditioning units for refreshing the interiors of plane cabins; fork lift trucks and self-propelled conveyors for loading and unloading cargo; and mechanized passenger loading stands.

In addition to the above equipment, the nation's airports make extensive use of heavy-duty gasoline trucks, oil and ADi carts, specialized trucks for

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engine test beds, and many types of miscellaneous auxiliary ground power equipment that is frequently built into jeep-type vehicle bodies. Runways are maintained quickly and easily by such mechanized equipment as sweepers with magnetic pick-ups and snow removal machines.

External Materials Handling

Mechanization of external materials storage and handling has been a logical extension of the increasing usage of mobilized equipment to reduce the costs of handling in warehouses and industrial plants. As a matter of fact, it is difficult to draw a district line of demarcation between some types of materials handling equipment which is designed for interior use and that which is specifically intended for outside operations.

For example, the familiar fork truck—electric, gasoline, Diesel, or propane—may be built in larger sizes and equipped with special heavy-duty attachments for work around storage areas, lumber yards, piers, construction projects, rail terminals, etc. It remains basically, however, the same machine that is used to stack cartons in warehouses or move parts to and from various plant areas. By the same token, other types of industrial trucks, such as platform units, may be readily adapted to outside as well as inside materials handling work.

There are, of course, many other types of materials handling equipment, such as straddle carriers, that are used primarly for external operations. It seems in order at this point also to re-emphasize the extensive use of basic construction machinery for external materials handling operations. For example, self-propelled, rubber-tired yard cranes, equipped with numerous front-end attachments, can and do perform many loading, unloading, and other handling tasks around plant and other sites. Similarly, crawler or rubber-tired tractors and allied equipment do considerable stockpiling and other types of handling work.

Power Mowers

The power lawn mower industry today resembles in some respects the automobile industry of the 1920's. Although there are now some 250 manufacturers producing power mowers, as compared with about 40 in 1941, industry observers are generally of the opinion that a saturation point, if any, is a long way off.

Before World War II, the use of

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power mowers was generally limited to commercial purposes or to well-to-do homes with large lawns. Post-war prosperity, coupled with the immense suburban homebuilding boom, has expanded the power mower market appreciably.

Aside from mechanized hand mowers, the demand for gasoline and electric mowers has soared in recent years. In fact, just one manufacturer sold approximately 44,000 power lawn mowers with a retail value of about $5.3 million in 1953.

Advances in Hydraulics

(*Continued from page 61*)

Vibration was noted as one of the causes for leakage in high pressure oil lines. A Ternstedt representative mentioned that aircraft practice of using Micarta blocks to support the longer lines at regular intervals has been found very effective in reducing vibration in one of their plants.

Except in the case of extremely large equipment, such as the outsized presses and forging equipment, automotive users prefer to stay with moderate pressures in hydraulic systems —in the range of 500 to 1000 psi. They reason that until leaks can be controlled in this range it is useless to consider higher pressures.

Preventive maintenance was constantly emphasized as the key to trouble-free operation. This led naturally to a discussion of hydraulic fluids. Petroleum fluids are predominately used, current practice in many plants being to use the additive types of premium hydraulic mineral oils. It was only natural to find that users are looking to the petroleum industry for further improvements in the product.

Management of hydraulic oils requires procedures to determine when the charge must be replaced. No hard and fast rules can be applied since each plant has its own unique problems. Detroit Diesel cited its procedure for chemical sampling of hydraulic fluids, basing the decision on the physical condition of the fluid as well as the neutralization number. One of the oil experts cautioned against too much reliance on neutralization number, noting that usually a sharp change in the rate of increase may be more significant than any specified value.

Considerable attention also was devoted to the practice of adequate filtration. It was pointed out that the hydraulic fluid may be subject to contamination from many sources, including dirt in the system, pollution from cutting fluids and water, as well as entry of dirt from the surroundings. There was general agreement that the system must be given the fullest protection if trouble-free performance was to be expected.

Inevitably discussion touched on the use of fire resistant hydraulic fluids. In the automotive industries fire resistant fluids are a must today on equipment such as resistance welding machines, die casting machines, forging equipment, and in other locations where there is a potential source of ignition such as in the heat treat.

It is generally recognized that fire resistant or safety fluids are extremely costly and have known disadvantages. By the same token it is conceded that such disadvantages must be charged up to the cost of insurance against hazard to life and property.

One of the petroleum experts summarized the situation as follows: currently there are three basic types of fire resistant fluids—straight synthetic; water base types consisting

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generally of a mixture of water and poly glycols; and soluble oil emulsions—of oil-in-water type, and water-in-oil type. The soluble oils are considered to be purely experimental at this writing.

Straight synthetics have good oxidation stability, anti-wear properties, and give rust protection. On the negative side, they offer a narrow range of viscosity, will damage conventional types of seals, and will surely remove conventional types of paint coatings. The water-base types have good low temperature characteristics, give good rust protection, and have shown satisfactory field service. However, the latter types may involve higher maintenance costs since the mixture stability must be checked and maintained at the proper level at all times. They, too, will remove conventional paints.

This specialist concluded by saying that fire protection is a matter of economics. Unless it can be afforded by conventional means and unless there is positive control of sources of ignition, there is no other course than to use the type of fire resistant fluid suitable for a particular problem.

Dr. Millett, of Carbide & Carbon Chemical, recommended further study of synthetic fluids, particularly as to their performance characteristics. He also emphasized the importance of conditioning the mechanical equipment before any change in fluid is made. Among the points to be covered are: complete cleanliness of the machine and plumbing lines to avoid contamination; test for tightness of all connections to eliminate leaks; imposition of temperature control; adequate filtration; and regular preventive maintenance procedure.

This view was vigorously supported by Robinson, Vickers chief engineer, who also stated that all Vickers systems equipment will function properly with any fire resistant fluid recommended by a reputable supplier.

As on previous occasions, Vickers assigned the operation of the conference to specialists representing the users and suppliers. The two moderators were: R. E. Russell, master mechanic, Chrysler Nine-Mile Press plant; and A. J. de Matteo, chief engineer, Watson-Stillman Co.

One of the highlights of the session was the public showing by D. J. Davis of a new film showing a sampling of the latest automation techniques practiced in the various divisions of Ford Motor Co.

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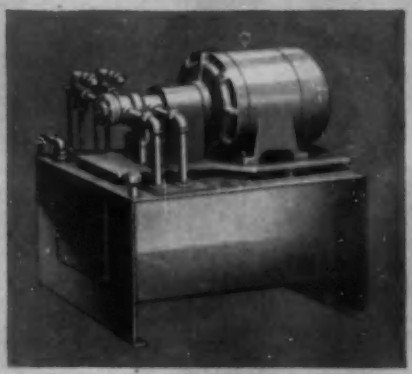

One of 60 Vickers Hydraulic Power Units used on this Cross Transfer-Matic. Some are standard units while others are custom-built by Vickers. Each is a complete "package" for an individual hydraulic circuit; it includes the necessary pumps, valves, oil reservoir, electric motor and controls, as well as all hydraulic accessories (oil filter, air cleaner, oil level gauge, etc.). The result is design simplification and savings in installation and maintenance costs.

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THIS latest list of Government prime contracts that have been awarded covers the period from March 24 to May 20, 1955. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

ACF INDUSTRIES, Engineering and Research Inc. Div. of, Riverdale, Md.
Maintenance of Government-owned flight simulators—$927,736

ACF INDUSTRIES, INC., Engineering Research Div., Hyattsville, Md.
Modification of F-86D flight simulator—4—$120,000

ACF INDUSTRIES, INC., New York, N. Y.
Modification and/or rehabilitation of 20 each T98E1 Vehicles—20—$418,471

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L-26A Aircraft and Auxiliary equipment—1—$74,868

AEROQUIP CORPORATION, Jackson, Mich.
Coupling—5—$28,236

AIRCOOLED MOTORS, INC., Syracuse, N. Y.
Engines Special tools—121—$387,491

ALLIS-CHALMERS MFG. CO., The Buda Co. Div., Harvey, Ill.
150 K W Diesel engine generator sets—4—$61,680

AMERICAN AUTOMOTIVE PRODUCTS COMPANY, Chicago, Ill.
Vehicle Parts—81750—$118,128

AMERICAN BOSCH CORP., Springfield, Mass.
Vibrator assys.—$510,003

AMERICAN BOSCH ARMA CORP., Arma. Div., Garden City, L. I., N. Y.
Fire control system, bomber flexible tail defense—58—$2,000,000

AMERICAN LOCOMOTIVE CO., Schenectady, N. Y.
Repair parts for diesel engines—1177—$56,287

AMERICAN MOTORS CORP., Detroit, Mich.
Protection and maintenance of GOCO plant, including production facilities—Job—$220,257
Classes 8, 10, 60, and 66, Motor-Vehicle Parts and Accessories, Gasoline and Diesel Engine Parts, and Construction and Road Building Machinery Parts—Indefinite

AVCO MFG. CORP., Lycoming Div., Stratford, Conn.
R-1300-4 engine—18—$708,040
R-1820-86 installation engine—92—$2,274,828

AVCO MFG. CORP., Lycoming Div., Williamsport, Pa.
Box assy.—various—$411,041
Spare parts for generator sets—various—$6,704,228
Spare parts—26175—$52,008

BELL AIRCRAFT CORP., Fort Worth, Tex.
HUL-1 Helicopters Test Articles—8—$1,584,836

BELLANCA AIRCRAFT CORP., New Castle, Del.
Installation of Fiber-glass Armour Plate on C-119 Elevators—61—$57,394

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Maintenance parts—various—$134,414
Brake assy.—618—$208,113
Wheel assy.—248—$1,652,661
Brake assys.—628
Rotor segment assys.—various—$66,500
Wheel assys.—186—$36,891
Wheel assys.—543—$954,543
Brake assys.—786

BENDIX AVIATION CORP., Eclipse Pioneer Div., Teterboro, N. J.
Transmitters Hydraulic pressure—$195,968
Indicators—4741—$1,691,162
Transmitter—1399—$594,575

(Turn to page 132, please)

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(Continued from page 130)

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Indicators, spare parts—$1,965,861

BENDIX AVIATION CORP., Pacific Div., North Hollywood, Calif.
Misc. actuators, timers—$98,403

BENDIX AVIATION CORP., Red Bank Div., Eatontown, N. J.
Panels and generators—various—$278,761
Generators—10—$66,249
Modification kits—2090
Generators, aircraft—224—$843,699

BENDIX AVIATION CORP., Scintilla Div., Sidney, N. Y.
Distributors—various—$544,739

E. W. BLISS COMPANY, Canton, Ohio
Catapults, Maintenance Spares & Special Tools—3—$1,835,000

BOGUE ELECTRIC MFG. CO., Paterson, N. J.
Power supplies for servicing Aircraft—77—$188,236

BORG-WARNER CORPORATION, Ingersoll Kalamazoo Div., Kalamazoo, Mich.
Engineering Services, improvement of landing vehicles tracked—$724,751

BORG-WARNER CORP., Pesco Products Div., Bedford, Ohio
Pumps—353—$216,529
Pump assys.—726—$145,324

BORG-WARNER CORP., Warner Gear Div., Muncie, Ind.
Transmission—1347—$59,241

BRUEST METAL PROCESSING CO., INC., Independence, Kans.
Repair and overhaul of aircraft engine accessories—36—$106,581

THE BUDA COMPANY, Harvey, Ill.
Trucks, forklift—4—$28,464

CANADIAN COMMERCIAL CORPORATION, Ontario, Can.
Spares and Ground handling equipment to support F86E—job—$13,985,633
R-1340-59 aircraft engine Modification and overhaul inst.—78—$1,120,940

J. I. CASE COMPANY, Racine, Wis.
Hay balers—3—$11,591
Disk plow trailing grain threshers—8

CATERPILLAR TRACTOR CO., Peoria, Ill.
Tractors and Parts—16—$325,599
Parts and Accessories—indefinite
Diesel Elec. Generating Sets—2—$46,910

CHRYSLER CORP., Detroit, Mich.
Automotive spare parts—17123—$162,361
Tank, flame thrower T67 complete with equipment—17—$1,204,739
Classes 8, 10, 60, and 66, Motor-Vehicle Parts and Accessories and Road Building Machinery Parts—indefinite
Spare parts—646—$182,611

CLARK EQUIPMENT CO., Battle Creek, Mich.
Trucks, forklift—203—$655,930

CLARK EQUIPMENT CO., Ross Carrier Div., Benton Harbor, Mich.
Trucks, Straddle—19—$333,127

CLEVELAND AERO PRODUCTS, INC., Cleveland, Ohio
Spare parts for H25A helicopter strut assy.—696—$81,404

(Turn to page 136, please)

carbides?

IMPELLER HUB — 4" diam., 1¼" long, from SAE 1146 annealed steel forging. JOB ANALYSIS determined multiple-spindle chuckers with ALL CARBIDE tooling.

11 operations on first side, on 6" Acme-Gridley 8-spindle chucker with double indexing and duplicate tooling. 2 pieces per cycle in 22½ seconds machine time — 320 pieces per hour.

17 operations on other side on single indexing 6" Acme-Gridley 8-spindle chucker. 26 seconds machine time — 138 pieces per hour.

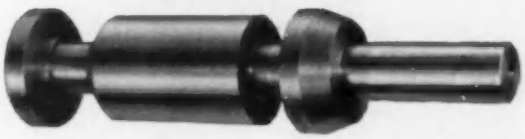
high speed?

SEAL RING — ½" thick, from 2½" diam. steel 6150 annealed. JOB ANALYSIS classed this as single-spindle job with HSS tooling.

5 shoulders rough and finish-formed to .002 tolerance, seat diam. held to .0005 tolerance, on 3½" single-spindle Acme-Gridley bar-type turret lathe. 7 minutes machine time — 8 (plus) pieces per hour.

Spindle speed automatically changed 4 times during cycle to provide suitable speeds and feeds for required finish.

or BOTH?



SHAFT — 7¾" long, from 1⅞" diam. steel 6250 annealed. JOB ANALYSIS indicated single-spindle bar-type turret lathe, with part CARBIDE and part HSS tooling.

10 operations including deep forming, turning and form-turning on 3½" single-spindle Acme-Gridley bar-type turret lathe: 5 minutes 46 seconds machine time — 9 (plus) pieces per hour.

5 automatic changes of spindle speed during the cycle provided speeds and feeds best suited for using both HSS and Carbide tools.

let the economics of the job dictate the right tooling method

(And the Right Machine)

All Acme-Gridleys are built with a rigidity factor to withstand the pressure of any cutting tool yet devised—at speeds as fast as modern cutting tools can "take it." With such a margin of power, speed and stamina built into each of National Acme's COMPLETE LINE of multiple- and single-spindle bar and chuck-type automatics, you can safely let the *economics* of the job dictate:

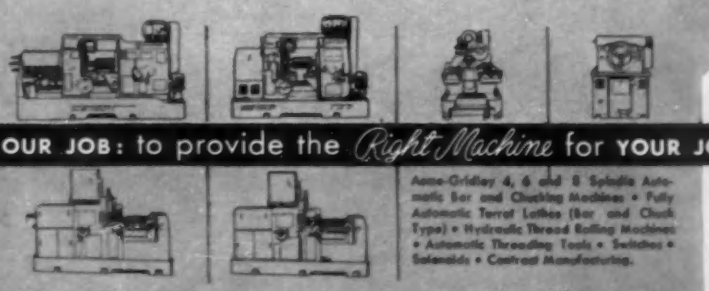
1. **The best tooling method.**
2. **The machine best suited to produce the job most economically.**

And you can be equally sure that tooling recommendations from National Acme will be based upon sound, experienced judgement.

If you would like a complete job analysis, we'd be glad to give you the benefit of our experience.

BOOTHS 324 AND 705

You can see National Acme's **COMPLETE LINE IN ACTION** at the Machine Tool Show. Study these modern machines. Ask questions. Then you'll learn why Acme-Gridleys are your best investment — for greater productivity today, and to maintain "new-machine-productivity" longer.

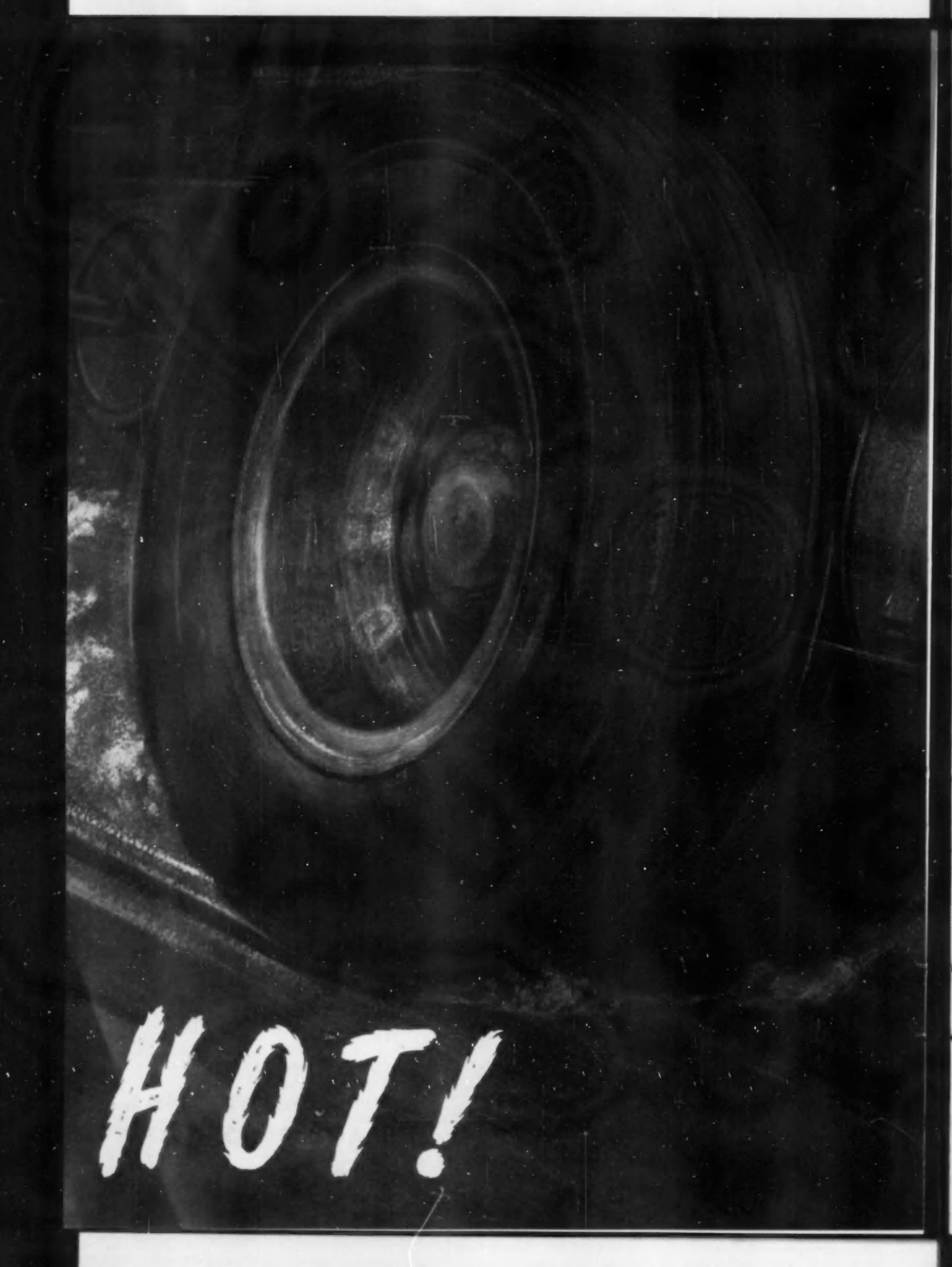


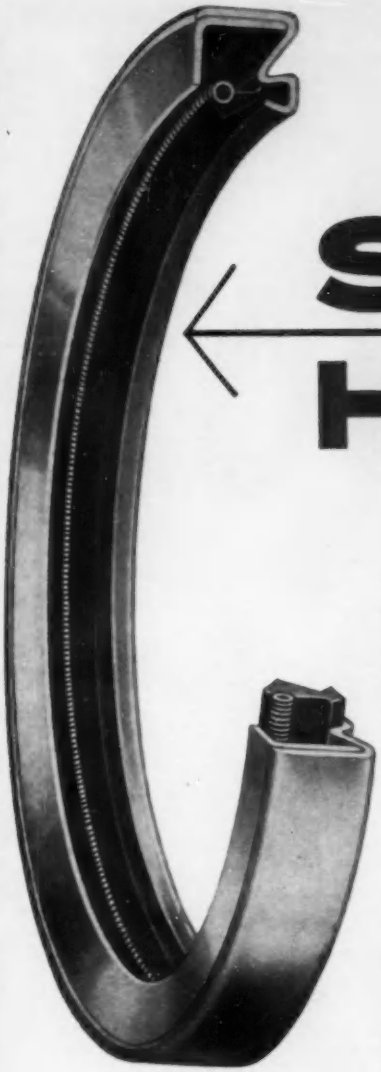
OUR JOB: to provide the *Right Machine* for **YOUR JOB**

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

THE NATIONAL ACME COMPANY

173 EAST 131st STREET • CLEVELAND 8, OHIO


HOT!



Braking big wheels won't burn

SIRVENE H-T Oil Seals

Now generally available, C/R's new sealing material resists temperatures up to 350° F.

Why the heat's on—Bigger engines, higher speeds, faster deceleration . . . these factors have pushed up temperatures in brake drums, axles, pinions and transmissions. Burn-out of oil seals has become a costly problem. With miles per year jumping to 120,000 and more, maintenance men know that standard oil seals can't take the heat, won't go the distance required on today's high-mileage fleets.

C/R research solves it—Sirvene HT Oil Seals are available in a series of high temperature synthetic rubber compounds developed from special polymers for exceptionally hot applications. They seal effectively at temperatures up to 350° F. With a longer service life than any previously known heat-resistant sealing material, Sirvene HT Oil Seals mean big savings for operators of trucks, buses, tractors, road machinery, automobiles and aircraft.

Five years of proved performance—Five years ago, exhaustive testing in C/R Research and Engineering Laboratories indicated the exceptionally high heat resistance and long service potential of Sirvene HT Oil Seals. Since then the dependability of these seals has been consistently demonstrated in aircraft, truck, road machinery and related applications.

Facts for engineers—Starting twenty years ago, Chicago Rawhide pioneered the development of high temperature sealing elements. First, Sirvis leather, then Sirvene (synthetic rubber) compounds which sealed effectively at 250° F. Now engineers may have the complete facts on this newest series of high temperature compounds.

Chicago Rawhide's unequalled oil seal development experience and facilities are also at your service. Please write.

C/R

PERFECT Oil Seals

More automobiles, farm equipment and industrial machines rely on C/R Oil Seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY

1301 Elston Avenue OIL SEAL DIVISION Chicago 22, Illinois

IN CANADA: MANUFACTURED AND DISTRIBUTED BY SUPER OIL SEAL MFG. CO., LTD., HAMILTON, ONTARIO
EXPORT SALES: GEON INTERNATIONAL CORP., GREAT NECK, NEW YORK

Other C/R products

SIRVENE: (Synthetic rubber) diaphragms, boots, gaskets and similar parts for critical operating conditions • CONPOR: Controlled porosity mechanical leather packings and other sealing products • SIRVIS: Mechanical leather boots, gaskets, packings and related products.

(*Continued from page* 132)

CONSOLIDATED DIESEL ELEC. CORP., Stanford, Conn.
Modification of 250 ground servicing units—$2,875,000
Engine generator sets—$10,036,748

CONTINENTAL AVIATION AND ENGRG. CORP., Detroit, Mich.
YJ69-T-17 engines special tools and ground handling equipment—12—$263,327
Engines, YJ69-T-9—2—$164,000
Engines, J69-T-19—2—
J69-T19 engines—41—$812,834
Starter generators, maintenance tools and test equip.—41

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Tank engine parts—3170—$172,004
Tank spare parts—10276—$104,497
PE 150-6 packette engines spare parts—1015—$4,498,804

COOPER - BESSEMER CORPORATION, Grove City, Pa.
Spare parts—3033—$53,850

THE CORNELIUS CO., Minneapolis, Minn.
Pneumatic Compressors—381—$599,919

CUMMINS ENGINE COMPANY, INC., Columbus, Ind.
Engine generator sets—2—$34,130

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, N. J.
Maintenance and Overhaul tools—$200,000
Maintenance tools and test equipment for R3350-34 engines—$64,526

DEERE AND COMPANY, Export Dept., Moline, Ill.
Grain Drill—12—$11,722
Tilting Platform—8
Trailers

DETROIT BEVEL GEAR CO., Detroit, Mich.
Motor vehicle parts—1975—$25,477

DETROIT HARVESTER CO., Warnes Div., Detroit, Mich.
Tank spare parts—459—$111,940

DORSEY TRAILERS, Elba, Ala.
Trailers—4—$31,780

DOUGLAS AIRCRAFT CO., INC., Long Beach Div., Long Beach, Calif.
Spare parts for C124 aircraft nose wheel—3974—$145,879

DOUGLAS AIRCRAFT COMPANY, INC., Santa Monica, Calif.
Maintenance parts—various—$34,163

DOUGLAS AIRCRAFT CO., INC., Tulsa, Okla.
Facilities for the cycle maintenance of B-47 aircraft—$350,000

DuPAGE GEAR & MACHINE CO., Elmhurst, Ill.
Vehicle parts—3564—$54,814

E. A. LABORATORIES INC., Brooklyn, N. Y.
Replenishment of kits—29367—$1,940,388

EASTERN ROTOCRAFT CORPORATION, Doylestown, Pa.
Automatic-release helicopter cargo hooks—28—$33,996

ELASTIC STOP NUT CORP. OF AMERICA, Union, N. J.
Nut—6146000—$127,79[illegible]

ELECTRONIC ASSOC., INC., Long Branch, N. J.
Computer—1—$30,775

GEORGE E. FAILING CO., ENID, Okla.
Trucks—6—$119,950

FAIRBANKS MORSE AND COMPANY, INC., Fair Lawn, N. J.
Diesel Engine Driven—lot—$12,578

FAIRCHILD ENGINE AND AIRPLANE CORP., Stratos Div., Long Island, N. Y.
Modifications—various—$69,456

FARGO MOTOR CORP., Detroit, Mich.
Station Wagons—503—$867,116

FARGO MOTOR CORP., Washington, D. C.
Light Trucks—22—$53,407
Trucks—112—$212,441

FARRAND OPTICAL CO., INC., New York, N. Y.
Bombsights Spare parts, maintenance tools—108—$2,595,271

MASSEY HARRIS FERGUSON, INC., Racine, Wis.
Vehicle Design Agency, Function Gage Design, Agency Function—job—$221,081

THE FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
Spare parts ORD-8—various—$10,000,000

(*Turn to page* 138, *please*)

CUT COSTS . . . FASTEN "ON THE DOUBLE" with the Chicago "214" DOUBLE RIVET SETTER

The "214" automatically feeds, inserts and clinches two rivets at a time . . . with speed that may mean a big saving in your fastening costs.

14" throat makes large assemblies easy to handle. For up to 9/64" diameter steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility.

Ask us how the "214" can help you cut costs. Send a sample of your problem assembly (or blueprint) for a Free fastening analysis.

FREE CATALOG contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
Branch Factory: Tyrone, Pa.

INDUSTRY GEARS FOR HIGHER PRODUCTIVE STANDARDS

C.P.C.* helps ALCOA trim massive forgings....and trim some costs too

Trimming a massive aluminum forging presents an unusually tough production problem. The irregular shape of the parts imposes tremendous off-center loading on the press ram. Then, too, the point at which the material shears is unknown. When the resistance against the ram changes, in a split-second, from, say, 1,500 tons to absolutely nothing, the shattering effect of break-through shock is the result.

Many problems as complicated as these had to be worked out by "Clearing Productivity Consultants" before they submitted plans for the press shown above to Alcoa engineers. An important consideration, for example, was manpower. In spite of its size, this machine is operated by just one man. From the remote, pulpit-like control station, the operator gets a wide-open view of the die area and he can put the full 2,000 tons of pressure to work with surgical deftness and precision.

Few people have a problem exactly like this one. But if you're thinking about boosting efficiency of your press-working facilities, we'd like to talk things over with you. Call on us at any time at no obligation.

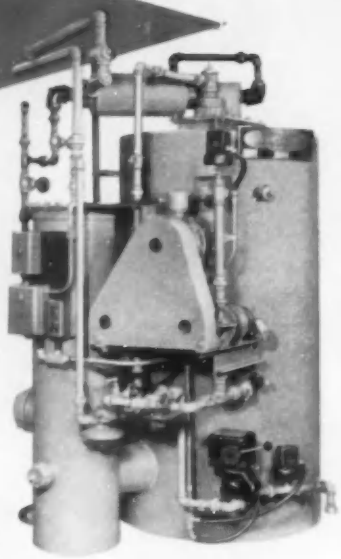
CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION DIVISION OF U. S. INDUSTRIES, INC.

6499 WEST 65TH STREET, CHICAGO 38, ILLINOIS • HAMILTON PLANT, HAMILTON, OHIO

Another

FIRST!



HOLCROFT'S NEW EXO-ENDO GAS GENERATOR

Holcroft has designed a radically-different exo-endothermic gas generator. Designed not only for the batch furnace but for other furnaces as well, the generator can produce gas atmospheres between the limits of perfect combustion and modified "302." At the latter setting, the gas generated has two main differences from a standard AGA Type 302 gas. The first is very much lower dewpoints—as low as minus 50 deg. F. with no detectable amounts of methane. In addition, the gas produced has an approximate 50% lower hydrogen content. This means that for a given carburizing potential, less hydrocarbon addition is necessary. The lower percentage of hydrogen is an added safety feature. The Holcroft process is covered by U. S. patent No. 2,589,810.

A slight adjustment at the generator can produce a non-explosive atmosphere to perform heat treating cycles below the explosive limits required for atmosphere tempering, annealing, and stress relief of ferrous alloys as well as hardening, annealing and tempering of non-ferrous alloys.

The new generator is an extremely compact unit (but 20 square feet of floor space is required.) The total gas used can be adapted to many manufacturing requirements.

If you have any kind of a heat treat problem—small or large—better call Holcroft.

HOLCROFT & COMPANY, 6545 Epworth Blvd., Detroit 10, Michigan.

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • DARIEN, CONN. • HOUSTON, TEXAS
LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario • EUROPE: S.O.F.I.M., Paris 8, France

(*Continued from page* 136)

FORD MOTOR COMPANY, Chicago, Ill.
Machinery and equipment for production of J-57 engines—$4,443,940

FORD MOTOR CO., Ford Div., Washington, D. C.
Light Trucks—209—$255,037
Trucks—216—$374,869
Automobiles—309—$414,628
Station Wagon—7—$13,601
Sedans—10—$14,716

FORMED TUBES, INC., Sturgis, Mich.
Automotive spare parts (supplement)—9000—$97,497

THE FOUR WHEEL DRIVE AUTO COMPANY, Clintonville, Wis.
Buses—2—$21,412
Trucks Mk 26 Mod O—6—$283,240
Trucks Mk 27 Mod O—54

THE GALION IRON WORKS AND MFG. CO., Galion, Ohio
Grader, Road, Motorized—2—$29,700
Parts and Accessories—indefinite

GARRETT CORP., Airesearch Mfg. Co. Div., Los Angeles, Calif.
Exchangers—143—$49,478
Cooler—416—$186,246
Cooler assy.—751—$143,628
Service and Material—various—$89,810
Actuators, gear boxes, shaft assys., screwjacks, power units—458—$733,699

GAR WOOD INDUSTRIES, INC., Wayne, Mich.
Winch assembly (supple.)—34—$50,391

GEAR GRINDING MACHINE CO., Detroit, Mich.
Automotive spare parts—6589—$218,623

GENERAL CONTROLS CO., Glendale, California.
Valve assembly—248—$31,843

GENERAL DYNAMICS CORP., Convair Div., San Diego, California
F-102A aircraft, spare parts and related items—$15,000,000
Spares on VC-131D airplanes—$894,050
28 TF-102A actf, spare parts—$5,000,000

GENERAL DYNAMICS CORP., Fort Worth, Tex.
Facilities for the modification of B-36 aircraft—$246,000
Rehabilitation and Improvement of Government-owned Plant 4—$730,000

GENERAL ELECTRIC CO., Philadelphia, Pa.
Bearing assys—various—$299,162
Bearings—17150—$153,493
Kits—5683—$656,671

GENERAL ELECTRIC CO., Schenectady, N. Y.
Indicators, tachometer—5258—$336,512
Generators, A. C. acft engine driven—$101,409

GENERAL ELECTRIC COMPANY, Washington, D. C.
Starter generator, type A-4—153—$94,021

GENERAL ELECTRIC CO., West Lynn, Mass.
Valves—1577—$73,850

(*Turn to page* 140, *please*)

CHROME RINGS

BY

Sealed Power

preferred by 28
leading engine builders

Sure, this is the age of chrome rings. But not just *any* chrome rings. Engine builders must be certain that the rings they use as original equipment can endure the heat, friction, abrasion and corrosion encountered in modern high speed motors.

That's why 28 leading engine builders use Sealed Power chrome rings.

They know the castings back of the chrome are of highest quality, made in Sealed Power's own foundry under strictest metallurgical control. They know Sealed Power's distinctive method of applying chrome results in a heavy permanent plating. They know that this is factory-lapped to a light-tight finish for fast break-in.

Let Sealed Power chrome rings help make your good engines even better!

SEALED POWER CORPORATION · MUSKEGON, MICHIGAN
ST. JOHNS, MICHIGAN · ROCHESTER, INDIANA

DETROIT OFFICE
5-164 General Motors Bldg.
Phone: Trinity 1-3400

Sealed Power
PISTON RINGS · PISTONS
CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings since 1911
Largest Producer of Sealing Rings for Automatic Transmissions · Power Steering Units

(*Continued from page* 138)

GENERAL ELECTRIC CO., X-Ray Dept., Milwaukee, Wisc.
Maintenance tools and test equipment $150,840

GENERAL MOTORS CORP, Detroit, Michigan
Parts and Accessories—Indefinite

GENERAL MOTORS CORP., AC Spark Plug Div., Flint, Michigan
Type A-4 gun-bomb-rocket sights, spare components spare parts, maintenance tools and test equipment—$2,339,659
Spare components and spare parts training parts—$370,000

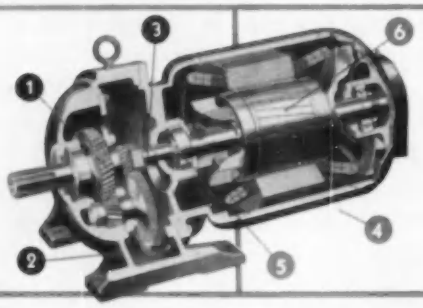
GMC, Allison Division, Indianapolis, Indiana
Spare parts for CD Transmission—2419—$166,827
Transmission Assembly Model CD-500-3—401—$3,408,500
Maintenance and overhaul of Turbo-Jet engines—5—$3,052,870

G. M. C. Chev. Motor Div., Detroit, Michigan
Light Trucks—62—$91,483
Automobiles—112—$149,807
Trucks—180—$241,386
Sedans, Station Wagons, Buses & Trucks—41—$72,794

to ***AUTOMOTIVE ENGINEERS, Howell suggests***

What to look for in Gearmotors

1. **Lifetime gearing.** The wear-resistance of gears depends, in good measure, upon their hardness. Howell's Duti-Rated Lifetime gears have a Rockwell hardness (52-60) substantially higher than the industry average.
2. **Compact, permanently aligned case.** Machine designers like the space-saving compactness of the Howell gear case. Pyramidal mounting puts support where it's needed — avoids the shaft misalignment possible when motor and gears have separate supports.
3. **Rugged, solid-shank pinion.** Howell's pinion design, with threaded coupling and self-broaching splines, makes a failure-proof shaft connection between motor and gears. No troublesome keys.



4. **NEMA-standard motors** give machine builders and users complete motor interchangeability, help them reduce inventories and simplify purchasing. Howell gearmotors give you this valuable feature — *with the new re-rated motors included!*
5. **Fully-protected bearings** insure longer motor life. Dirt can't enter Howell's double-shielded bearings either from inside or outside the motor, because they are sealed in the end-plate cavities by dust-tight inner caps.
6. **Copper-clad rotors** mean better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your particular motor requirements. *All* Howell motors have them.

Gearmotors Cut Costs. Actual savings achieved by Howell gearmotors over separate motor-plus-reducer-plus-coupling drives are available for your study. Just request "Gearmotor Savings Table" when you write for catalog.

Write for Bulletin GM-1

Howell gearmotor capacities: Parallel shaft, 1 to 150 hp; Right angle shaft, ½ to 40 hp.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built motors for industry since 1915

HOWELL MOTORS

GENERAL MOTORS CORP., Cleveland Diesel Engine Div., Cleveland, Ohio
Repair parts for diesel engines—2014—$121,403

GENERAL MOTORS CORP., Delco Products Div., Dayton, Ohio
Motors—409—$32,713

GENERAL MOTORS CORPORATION, Detroit Diesel Engine Div., Detroit, Michigan
Spare parts—13927—$26,178

GENERAL MOTORS CORP. Euclid Division., Cleveland, Ohio
Modification on one type A-2 tow tractor —1—$2,596,612
Tractor, aircraft towing—57
Spare parts

GMC, Fisher Body Div., Detroit, Michigan
Spare parts for mount combination, 90MM, T148 (utilized on M48 tank)—24100—$87,741

GMC, GMC Truck and Coach Div., East Pontiac, Michigan
Automotive parts—44958—$26,827
Trucks—5—$12,630
Spare parts—680008—$456,082
Automotive spare parts (supplement—1239456—$521,254

GENERAL MOTORS CORP., New Departure Div., Bristol, Conn.
Bearing—50000—$55,000

GMC, United Mtrs Serv. Div., Detroit, Michigan
Automotive spare parts—9362—$302,298
Motor Vehicle parts—4808—$35,579
Spare Parts—22260—$45,414

GERLINGER CARRIER CO., Dalas, Ore.
Trucks, forklift—10—$65,600

THE B. F. GOODRICH CO., Akron, Ohio
Wheel assys.—510—$38,372
Cell assy.—4—$391,779

THE B. F. GOODRICH CO., Dayton, Ohio
Wheel assy.—200—$81,189
Brake assy.—270

THE GOODYEAR TIRE AND RUBBER CO., Akron, Ohio
Brake assy.—940—$175,451
Tools—200—$68,112
Wheel assy.—186—$33,084
Brake assys.—720—$299,039
Wheel assys.

HENSEL GREEN AND COMPANY, Chicago, Ill.
Tractors, aircraft spotting—55—$285,780

GREER HYDRAULICS, INC., Jamaica, N. Y.
Stands—117—$282,545

HA DEES HEATER DIV., Rockford, Ill.
Replenishment of kits—5200—$337,740

HALL-SCOTT MOTORS CO., Berkeley, Calif.
Overhaul of Class—job—$137,918
Spare Parts—108—$42,003
Classes 8, 10, 60, and 66, Motor-Vehicle Parts and Accessories and Road Building Machinery Parts—indefinite

HARNISCHFEGER CORP., Milwaukee, Wis.
Excavator—2—$41,280

THE HEIL COMPANY, Milwaukee, Wis.
Scrapers, Tractor Drawn—4—$32,353

(*Turn to page* 144, *please*)

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Mills, core-drills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross!

Economy and auto*mation* are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72″-diameter 8-position automatic index table, complete with shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

Operations formerly accomplished by eight machines were combined in this Buhr Special —and volume of production was increased! . . . A typical example of Buhr Economation!

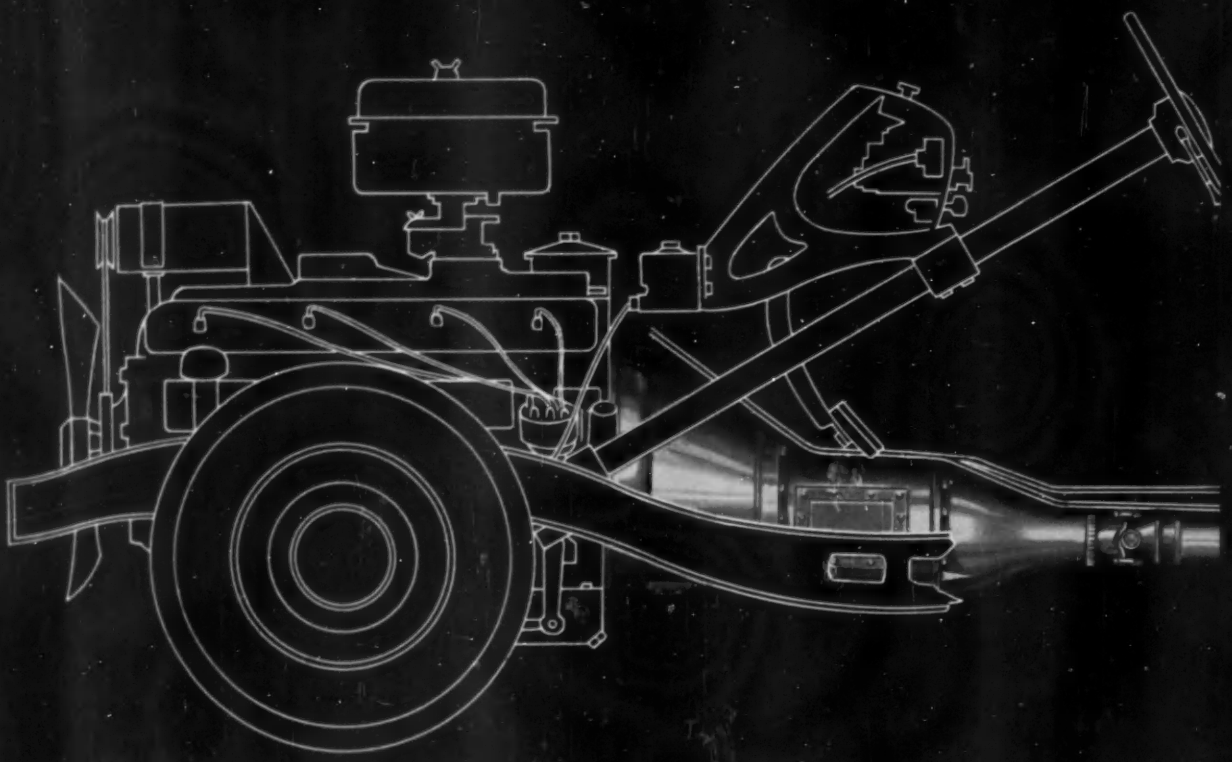
Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

WE ARE EXPERTS IN PROP-SHAFT PROBLEMS.....



DANA CORPORATION,

Fred

We've got to lower that prop shaft — better call Spicer!

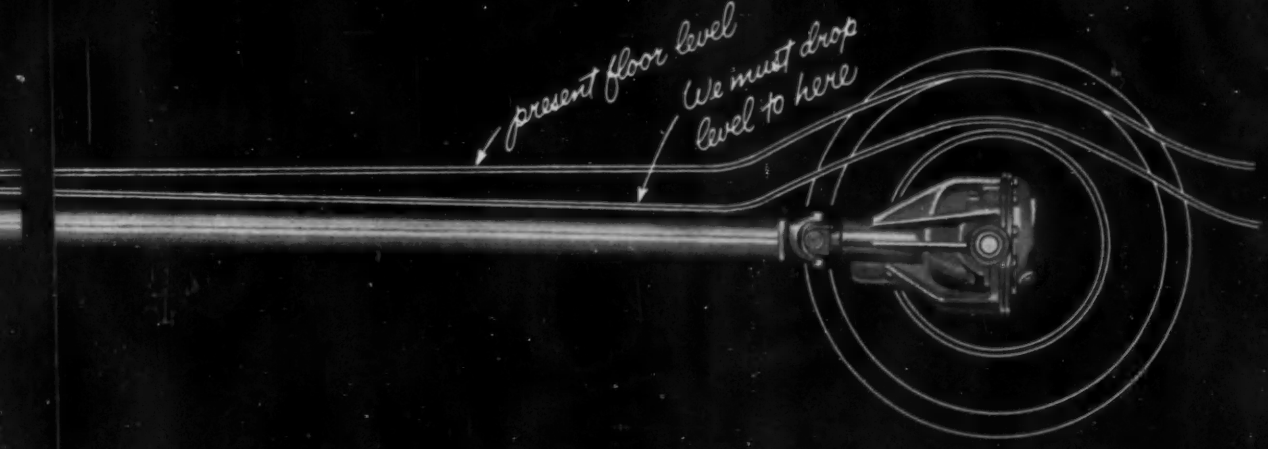
Ben

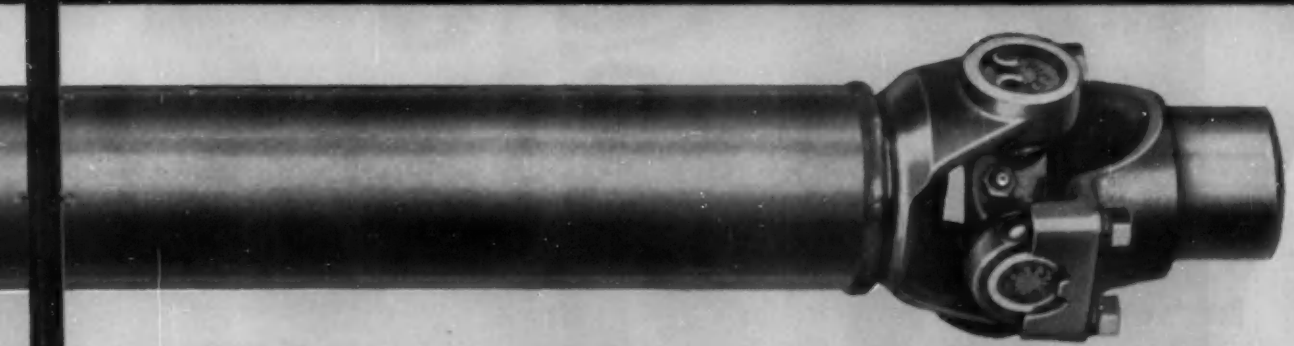
Problems of prop-shafts as related to lower floors . . . lower frames . . . engine angle . . . axle alignment . . . and other modern developments in motor, chassis and body designs . . . are welcomed by Dana.

Dana engineers are working on today's propeller shaft problems with every passenger car manufacturer, and are developing efficient Spicer designs to cover many different and complicated requirements!

Dana engineers have accumulated an invaluable fund of propeller shaft and universal joint design knowledge . . . the result of over 50 years experience in this field. Spicer originated the automotive universal joint and propeller shaft . . . and Spicer products have been built into practically every type of motor vehicle that has been manufactured.

Ask Dana to help solve your prop-shaft problems!



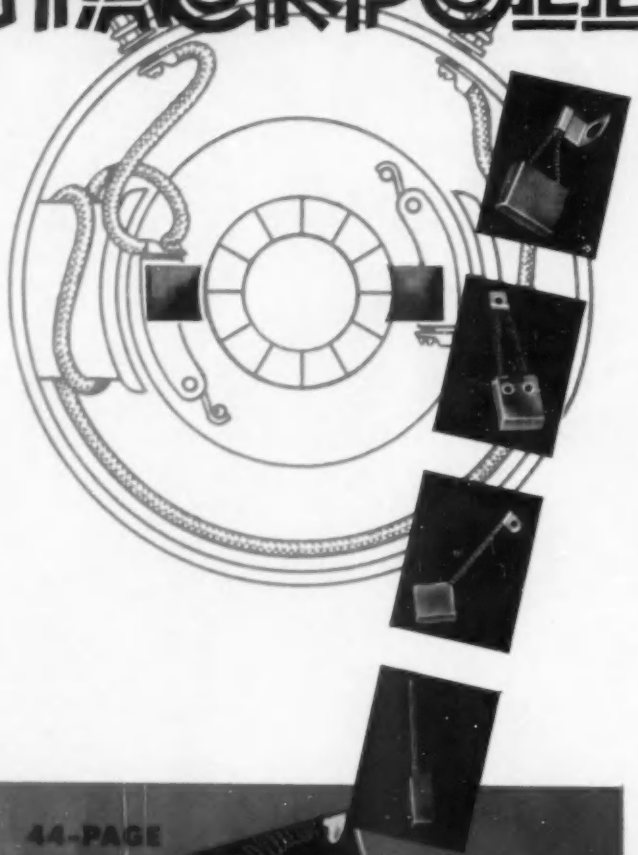


TOLEDO 1, OHIO

SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER AND AUBURN CLUTCHES • PARISH FRAMES

The name that has signified small motor and generator brush progress and reliability since the earliest days of the industry.

STACKPOLE



44-PAGE BRUSH DATA BOOK

Write on company letterhead for Stackpole Brush Data Book #20

Address:
STACKPOLE CARBON COMPANY
St. Marys, Pa.

Brush and Contact Headquarters for over 40 years

(*Continued from page* 140)

HIGGINS, INC., New Orleans, La.
Swampfox Vehicles—2—$46,492

HOLLEY CARBURETOR CO., Van Dyke, Mich.
Maintenance parts—various—$52,822

HOUDAILLE-HERSHEY CORPORATION, Buffalo, N. Y.
Dampers—82—$48,155
Spare parts for shimmy dampers for H25A helicopters—240—$90,072

THE FRANK G. HOUGH CO., Libertyville, Ill.
Tractor, carrier plane, towing, diesel—35—$163,095

HOWE FIRE APPARATUS CO., Anderson, Ind.
Trucks—2—$20,038

INDIANA GEAR WORKS, INC., Indianapolis, Ind.
Facilities for the protection of helicopters gears—$1,000,000

INGERSOLL-RAND CO., Los Angeles, Calif.
Impact wrench, electric—443—$78,101

INGERSOLL-RAND CO., Washington, D. C.
Air Operated Tools and Accessories—$32,499

INTERNATIONAL HARVESTER CO., Washington, D. C.
Carryalls—20—$34,460
Trucks—61—$150,156
Parts and Accessories—indefinite

JACK AND HEINTZ, INC., Cleveland, Ohio
Starters—various—$669,302
Generator—various—$490,644

JACOBS AIRCRAFT ENGINE COMPANY, Pottstown, Pa.
Repair parts for engine—4338—$31,762

HENRY R. JAON AND SON, INC., New York, N. Y.
Threshers and Spare Parts—$77,265

JOY MANUFACTURING CO., Pittsburgh, Pa.
Design and development of an experimental Mobile Automatic Earth Auger—job—$30,000

THE LEECE-NECILLE CO., Cleveland, Ohio
Spare parts—10578—$43,592

LE TOURNEAU-WESTINGHOUSE COMPANY, Peoria, Ill.
Parts and Accessories—indefinite

LOEWY CONSTRUCTION CO., INC., New York, N. Y.
Extrusion tools for horizontal extrusion presses—$1,137,060

McKIERNAN-TERRY CORP., Harrison, N. J.
Catapults, Maintenance Spares & Special Tools—4—$2,451,632

MARMON-HERRINGTON CO., INC., Indianapolis, Ind.
Spare parts—170—$375,000
Type MB-1 crash fire truck—25—$800,000

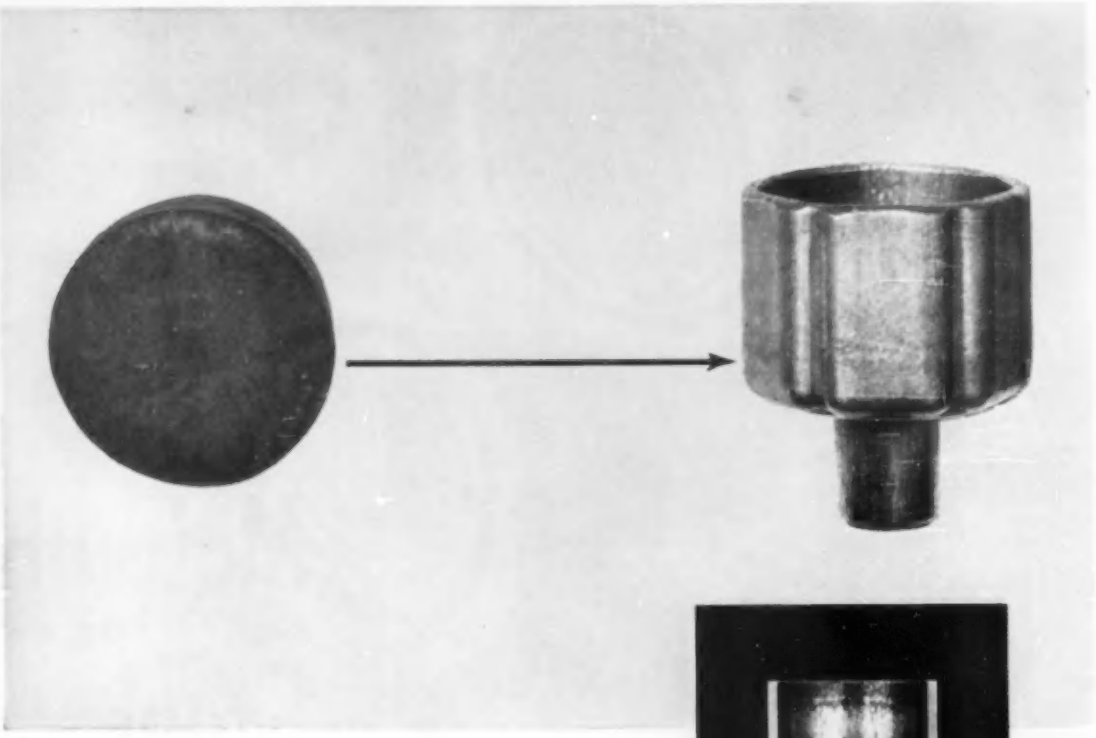
THE GLENN L. MARTIN CO., Baltimore, Md.
B-57E airplanes, spare parts, special tools and GHE—$10,000,000
Hatch assy., panel assy.—various—$99,486
Modification of RB-57A aircraft—$750,000

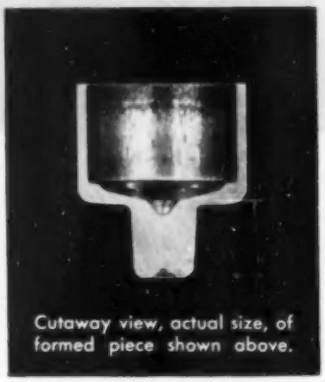
(*Turn to page* 147, *please*)

McLouth STAINLESS Steel

High quality stainless sheet and strip steel . . . for the product you make today and the product you plan for tomorrow.

McLouth Steel Corporation
DETROIT, MICHIGAN
Manufacturers of Stainless and Carbon Steels





Cutaway view, actual size, of formed piece shown above.

COLD FORMED IN ONE OPERATION

—with Bonderite and Bonderlube!

An experienced production man looked at this blank and the formed parts and said flatly, "It can't be done!" But *it is being done* — in one operation — on a production basis of thousands of units per day.

The blank is treated with Bonderite, and then with Bonderlube. This combination works with remarkable effectiveness.

These two Parker products effect big savings in other ways besides raising production levels. Tool and die breakage declines sharply, fewer process anneals are necessary, operation is simplified, scrap is minimized, and machining operations are reduced.

Cold extrusion, with Bonderite and Bonderlube, may hold the key to cost-cutting for you. Write for information!

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

Since 1915— leader in the field

PARKER RUST PROOF COMPANY
2178 E. Milwaukee, Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

(*Continued from page* 144)

MET-PRO., INC., Lansdale, Pa.
Stands: engine—260—$206,252

MILLER MFG. CO., Detroit, Mich.
Combat Vehicle Parts—474—$33,132

MINNEAPOLIS-MOLINE COMPANY, Minneapolis, Minn.
Classes 8, 10, 60 and 66, Motor-Vehicle Parts and Accessories Gasoline and Diesel Engine Parts and Construction and Road Building Machinery Parts—indefinite

MOBILE DRILLING CO., INC., Indianapolis, Ind.
Truck and Drilling Unit—1—$13,441

MUSKEGON PISTON RING CO., Muskegon, Mich.
Automotive spare parts—10540—$31,019

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
Aircraft, and related equipment—215—$12,607,898
Modification of F86D Vertical Stabilizers—job—$64,197

NORTHROP AIRCRAFT INC., Hawthorne, Calif.
Requirements to reflect data to F89H aircraft, training parts and equipment—$2,224,275
Reeling machine, cable, pneumatic, internal—30—$150,000

NORTHWESTERN MOTOR CO., Eau Claire, Wis.
Tractors, warehouse—458—$973,836

OSHKOSH MOTOR TRUCK INC., Oshkosh, Wis.
Trucks—2—$31,740

OUTBOARD MARINE AND MFG. CO., Johnson Motors Div. of., Waukegan, Ill.
Repair parts for gasoline engines—22525—$189,008

PASTUSHIN AVIATION CORP., Los Angeles, Calif.
Fuel tanks—$86,734

PERFECTION STOVE CO., Cleveland, Ohio
Engine-heater assy.—various—$467,181

THE PIERCE GOVERNOR CO., INC., Anderson, Ind.
Repair parts for diesel engines—625—$25,402

PIONEER ENGINEERING WORKS, INC., Minneapolis, Minn.
Parts and Accessories—indefinite

PUROLATER PRODUCTS INC., Rahway, N. J.
Element Assy.-Filler, Restricter Valves for Hydraulic Systems—23502—$26,792

THE OLIVER CORP., Export Div., Chicago, Ill.
Crawler Tractors—14—$90,146

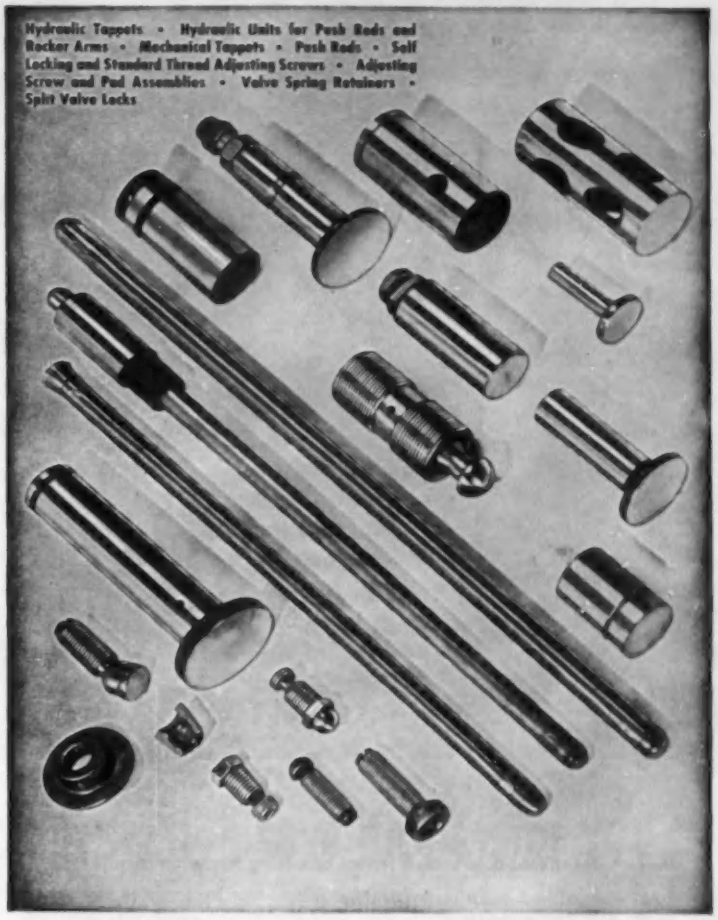
RED LION CABINET CO., Redco Tool Div., Red Lion, Pa.
Missile skid—70—$47,180

REO MOTORS, INC., Lansing, Mich.
Trucks, 2½ T.—514—$3,750,671
Automotive spare parts (supplement)—55123—$646,770
Motor vehicle parts—617—$31,929

(*Turn to page* 148, *please*)

"CHICAGO"
precision valve gear parts

●STEEL ●CAST IRON ●STEEL and IRON



Hydraulic Tappets • Hydraulic Units for Push Rods and Rocker Arms • Mechanical Tappets • Push Rods • Self Locking and Standard Thread Adjusting Screws • Adjusting Screw and Pad Assemblies • Valve Spring Retainers • Split Valve Locks

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
Cylinder Head Studs.....Cylinder Head Cap Screws
Main Bearing Studs.....Main Bearing Cap Screws
Flywheel to Crankshaft Screws.....Diesel Energy Cells
Wheel Bolts and Studs.....Differential Carrier Screws
Oil Pump to Distributor Shafts.....Rocker Arm Shafts
Automatic Transmission Valves.....Water Pump Shafts
Roller Followers.....Ball Joint Assemblies

External and Internal Grinding, Thread Grinding, Precision Roll Threading

Heat Treating • Carbon Restoration • Carburizing • Carbo Nitriding • Cyaniding • Hydrogen Brazing • Complete Metallurgical, Dynamometer and Testing Laboratories

Special Screw Machine Parts 1/16" to 5" Diameter
• *Cold Upset 3/16" to 1" Diameter* • *Cap Screws*
• *Set Screws* • *Nuts* • *Studs* • *Taper Pins*
• *Socket Screw Products*

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILLINOIS
Established 1872

(*Continued from page* 147)

Spare parts—4507—$62,394
Truck, Cargo—4—$33,437
Motor, Fluid, Cable Wrecker Hoist—194—$54,661

REPUBLIC AVIATION CORP., Farmingdale, L. I., N. Y.
F-84F mobile training units—$143,712
Special tools and GHE for 177 B-57 airplanes—$290,100

W. A. RIDDELL CORP., Bucyrus, Ohio
Motor Grader—1—$11,035

RONAN AND JUNZL, INC., Marshall, Mich.
Trailer—70—$43,288

ROYAL JET, INC., Alhambra, Calif.
Jettisonable fuel tanks—9730—$2,600,050

RYCO ENGINEERING COMPANY, INC., Detroit, Mich.
Engineering and design of gages—job—$90,000

SPERRY CORP., Sperry Gyroscope Co., Div., Great Neck, N. Y.
Automatic pilots spare parts, special tools and test equipment, data—$1,216,372

STERLING ENGINE CO., Buffalo, N. Y.
Repair Parts for Diesel Engines—3686—$70,913

STUDEBAKER-PACKARD CORP., Detroit, Mich.
Repair parts for diesel engines—3502—$95,894

SUNDSTRAND MACHINE TOOL CO., Sundstrand Aviation Div., Rockford, Ill.
Constant speed drives, spare parts—819—$6,464,580

SURFACE COMBUSTION CORPORATION, Janitrol Aircraft-Automotive Div., Columbus, Ohio
Heater assy.—3—$178,364

TERRY INC., Washington, D. C.
Press, hydraulic portable, 100 ton—30—$88,403

THE THEW SHOVEL CO., Elyria, Ohio
Engines—30—$53,443

TRI-STATE TRACTOR PARTS COMPANY, INC., Portland, Ore.
Parts and Accessories—indefinite

TWIN COACH COMPANY, Kent, Ohio
Classes 8, 10, 60, and 66, Motor-Vehicle Parts and Accessories and Road Building Machinery Parts—indefinite

TWIN DISC CLUTCH CO., Racine, Wis.
Repair parts for Diesel Engine—2350—$28,904

UCINITE CO., Newtonville, Mass.
Motor vehicle parts—19540—$195,400

UNITED AIRCRAFT CORPORATION, Pratt & Whitney Aircraft Div., East Hartford, Conn.
Services and material—837—$209,250

UNITED AIRCRAFT PROD., INC., Dayton, Ohio
Valve-Oil Cooler—762—$140,817
Spring valve—38—$82,350

UNITED AIRCRAFT CORP., Sikorsky Aircraft Div., Bridgeport, Conn.
H19D helicopters, spares, GHE and data—55—$3,000,000
Spare parts—$1,995,139

U. S. INDUSTRIES, INC., Pressed Steel Car Co. Div., New York, N. Y.
Locomotives—4—$25,788

VICKERS, INC., Detroit, Mich.
Pumps—various—$252,236
Hydraulic valves—21—$43,856

WATSON AUTOMOTIVE EQUIPMENT CO., Washington, D. C.
Ambulances—3—$18,066

WESTERN GEAR WORKS, Lynwood, Calif.
Gear Boxes—81—$47,188
Overhaul Gear Boxes—150—$27,900

WESTINGHOUSE ELECTRIC CORP., Lima, Ohio
Generator—445—$369,109
Regulator, voltage data—259

WESTINGHOUSE ELECTRIC CORP., Philadelphia, Pa.
Controls—various—$436,861

WESTINGHOUSE ELECTRIC CORP., Washington, D. C.
Dynamometer and Accessories—$10,846

THE WHITE MOTOR CO., Cleveland, Ohio
Parts and Accessories—indefinite

WILLYS MOTORS, INC., Toledo, Ohio
Trucks—78—$151,517
Light Trucks—87—$167,038

(*Turn to page* 150, *please*)

Good Temperature Control is essential

. . . TO HEAVY DUTY POWER!

Vernatherm thermostats assure *correct* operating temperature.

Solid charged and precision built, these thermostats have proved themselves in the field over and over again. They have proved that rough duty and rigid limitations need not mean frequent thermostat replacement!

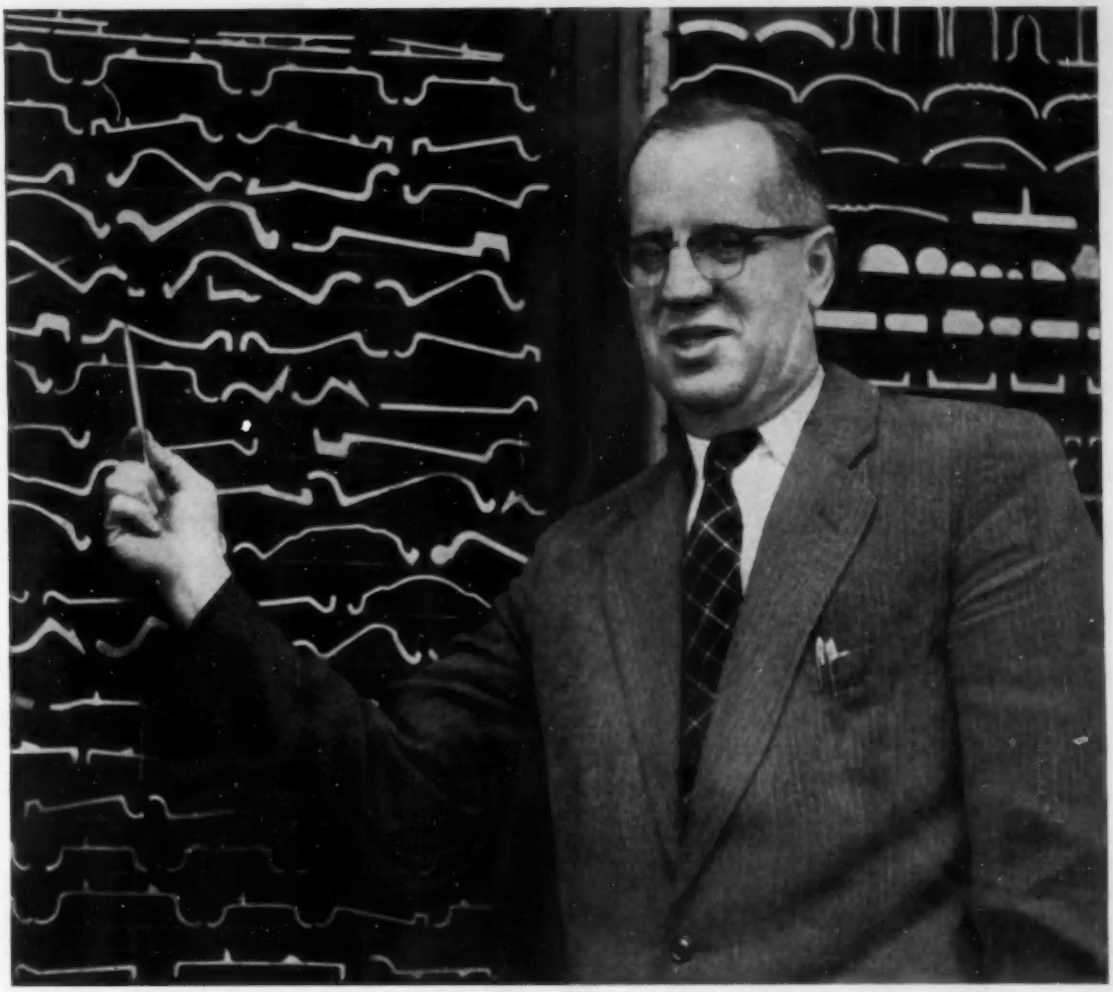
Detroit Controls Corporation pioneered Vernatherm thermostats to meet the needs of modern pressurized cooling systems. They have solved a great number of tough problems on Diesel, heavy-duty gasoline and jet engines. Vernatherm controls might be the solution to a situation in *your* engines.

Call on DETROIT sales engineers for test data and actual field results . . . or write for Bulletin 213 which gives basic data on Vernatherm controls and their function in modern engine design.

DETROIT CONTROLS CORPORATION
6900 TRUMBULL AVE. DETROIT 8, MICHIGAN
Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

Representatives in Principal Cities
Canadian Representatives:
RAILWAY AND ENGINEERING SPECIALTIES, LTD.
Montreal, Toronto, Winnipeg

AUTOMATIC CONTROLS FOR REFRIGERATION • AIR CONDITIONING
DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
SERVING HOME AND INDUSTRY
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS
KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS



Could a special rolled section save money for you?

It wouldn't surprise us a bit if a special section, perhaps similar to one of these, could save you a barrel of money.

Special sections, hot-rolled to your drawings and specifications, have many advantages. They eliminate costly machining, forming and fabricating; they allow you freedom of design. Rolling puts extra metal where you want it for strength; eliminates excess metal for economy.

The display of special sections shown here gives you some idea of the wide range of shapes that are rolled by Bethlehem, helping manufacturers in many lines to reduce their costs.

Among Bethlehem special sections used by the automotive industry are tire rims, door hinges, generator and starter pole pieces, and brake shoes, to name a few applications.

Perhaps we could help you determine how special sections can cut your production costs. We suggest you contact the Bethlehem sales office most convienient to you.

Bethlehem carbon-steel bar products for the automotive industry include hot-rolled carbon bars in standard and special sections and bar-size shapes. Also semi-finished products, including blooms, billets and slabs.

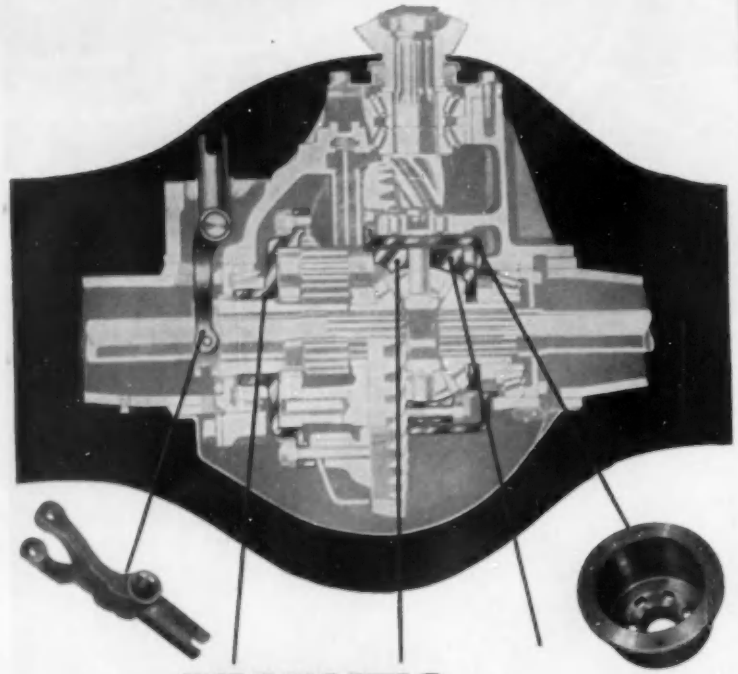
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

for **HEAVY DUTY** service



PEARLITIC MALLEABLE CASTINGS

The 2-speed truck axle is a *must* under varying load and road conditions because it provides a tailor-made ratio for every condition. But it takes a severe beating under heavy duty conditions encountered in logging, mining, farming, etc.

That's why Eaton Manufacturing Company, leading producer of 2-speed axles, specifies pearlitic malleable — from National — for several vital parts. For Eaton knows that pearlitic malleable has high ultimate strength . . . resists wear under heavy loads at high speeds . . . possesses excellent non-seizing properties. In addition, pearlitic malleable can be given a smooth finish . . . can be either liquid or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

Look your product over critically. Pearlitic malleable castings—from National—can replace costlier fabrication methods . . . can offer opportunities of reduction in weight, machining and assembly time. AA-1197

Photos: Courtesy Eaton Manufacturing Company

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

(*Continued from page* 148)

Station Wagon—6—$16,850
Jeeps—3
Classes 8, 10, 60, and 66, Motor-Vehicle Parts and Accessories and Road Building Machinery Parts—indefinite

WILLYS MOTORS, INC., Washington, D. C.
Trucks & Spares—22—$39,077

WIRE ASSEMBLIES CORP., Detroit, Mich.
Automotive spare parts—5000—$37,012

THE YALE AND TOWNE MFG. CO., Automatic Transportation Co. Div., Chicago, Ill.
Rebuild explosion resistant forklift trucks —172—$673,870
Truck, forklift, electric—19—$64,205

THE YALE AND TOWNE MFG. CO., Yale Materials Handling Div., Philadelphia, Pa.
Truck, forklift—41—$144,276

Two-Stroke Diesel Has No Crankshaft

(*Continued from page* 72)

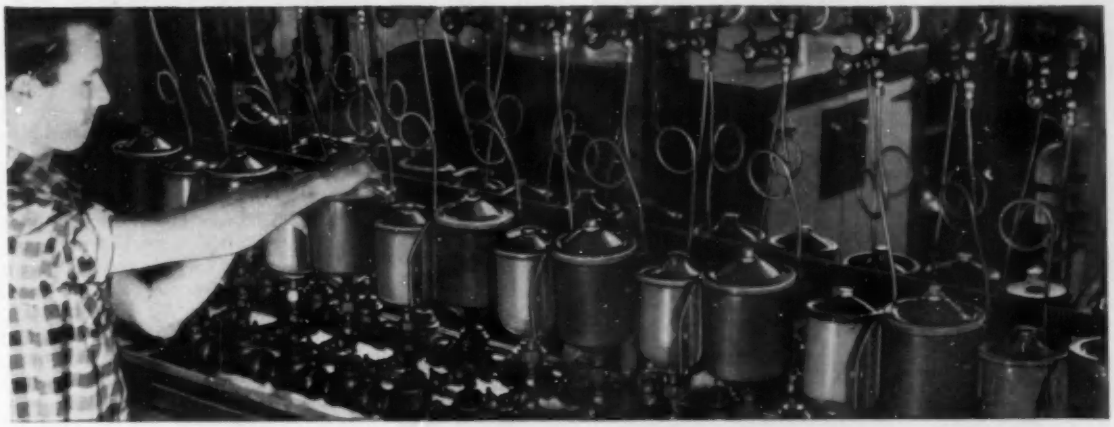
The oil pump not only serves to circulate the lubricating oil but also furnishes oil pressure for propeller-pitch control. A piston-type water pump is driven through worm gearing. It is double-acting, the upper end circulating cooling water, while the lower end serves as a bilge pump. By making the speed of the pump shaft proportional to the number of cylinders, the same pump can be used for engines with any number of cylinders. It was originally intended to make use of the Kadenacy effect for scavenging purposes, but it was found that this was inadequate, and a small blower delivering air at 1.5 psi pressure is now fitted. Tests made on a three-cylinder stationary engine are said to have shown a minimum consumption of about 0.34 lb per bhp-hr.

The weight of the engine is about 55 lb. per bhp.

Number of GM Shareholders Increases to 510,390 Total

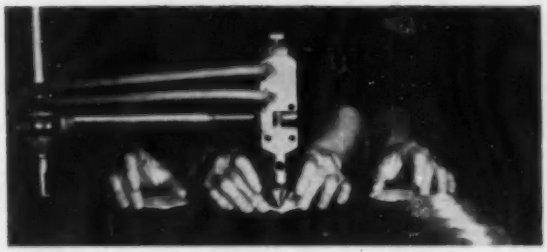
General Motors Corp. has reported that the number of common and preferred shareholders increased to 510,390 persons on May 17, compared with 487,639 on record at the end of last year. The corporation noted that four fifths of its stockholders own fewer than 100 shares each. Last February, GM offered more than four million new common shares to raise approximately $325 million permanent working capital.

NOW! DAREX Flowed-in GASKETS for OIL FILTERS and AIR CLEANERS



A section of the Dewey and Almy laboratories where DAREX *"Flowed-in" gaskets for oil filters have been tested to specification: 100 hours at 280°F under 40 lbs. pressure using S.A.E. 20 oil.*

THE "FLOWED-IN" WAY. *With a* DAREX *semi-automatic machine, there are only two hand motions. Operator feeds with one hand, clears with the other.*



THE SAVINGS in labor and materials that DAREX "Flowed-in" gaskets have brought to other automotive parts are now available to manufacturers of oil filters and air cleaners.

Dewey and Almy development engineers have made an exhaustive study into the problems of gasketing these products. The results, which are available to you for the asking, indicate that DAREX "Flowed-in" gaskets cut deeply into the cost of hand assembly.

Here's why the "Flowed-in" process cuts costs

The amazingly-simple "Flowed-in" process eliminates the excessive time, motions and money required in hand assembly of gaskets to the lids of oil filters and air cleaners. In the "Flowed-in" process, the lids are revolved automatically while a uniform circular track of liquid gasket material is deposited where needed. Baking or drying transforms the fluid into a rubbery gasket that adheres to the lid. You save — in labor, by eliminating hand assembly — in materials, by eliminating waste and improving quality.

Dewey and Almy provides everything you need to take advantage of these savings: tested gasketing compounds, application equipment, more than 30 years of research and engineering experience. Let us show you specifically what your savings will be from the DAREX "Flowed-in" gasket process! Phone, wire or mail the coupon *today!*

Discover what DAREX "Flowed-in" GASKETS can do for you!

MAIL THE COUPON TODAY!

DEWEY AND ALMY CHEMICAL COMPANY
Division of W. R. Grace & Co.
Cambridge 40, Mass.
Please send me the new DAREX Flowed-in GASKET Brochure.

Name _____

Firm _____

Street _____

City _____ State _____

DEWEY and ALMY
Chemical Company
DIVISION OF W. R. GRACE & CO.
Cambridge 40, Massachusetts

Latest Developments at

MATERIALS HANDLING EXPOSITION

HERALDING the "push-button" age in handling products and materials, the Sixth National Materials Handling Exposition in Chicago last month provided visitors with a $10 million array of new equipment. The concurrent Conference of the American Material Handling Society brought forth stimulating ideas for more efficient solutions to many types of handling problems.

Among the new developments on display were load-carrying vehicles, overhead conveyors, roller conveyors, various boxes for carrying and storing parts, storage racks, engines and motors for powering vehicles and conveyors, hoists, control devices, and lubricating and filtering equipment (see AI, May 15 issue, pages 81-84).

In addition to its latest line of motors and controllers, Westinghouse demonstrated a d-c motor brake, which requires no attachment on the a-c motor shaft. The device is designed to give a positive, controlled stop in a minimum of time, without locking the shaft afterwards. Brooks and Perkins, Magline and National Light Metals showed magnesium hand trucks, parts trucks and mobile racks of extremely light weight construction.

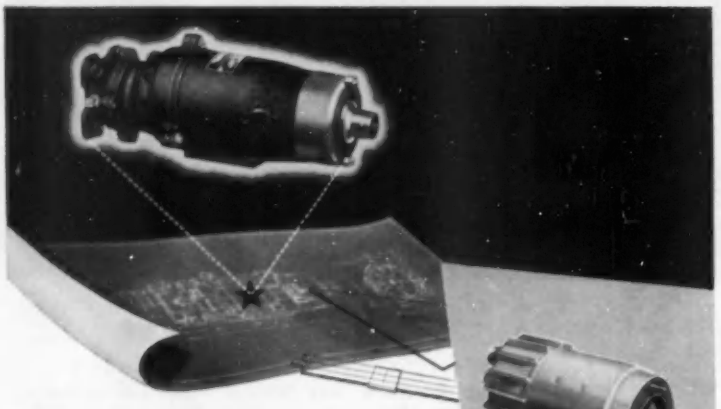
Small fire trucks and other light special-purpose vehicles were shown by Kalamazoo Mfg. Co. Industrial engines for vehicular and other uses were displayed by Caterpillar, Continental, Ford, International Harvester, Waukesha and Wisconsin. Radio control for vehicles, according to displays by RCA Victor and Motorola, may well be feasible for even the smaller plants.

Rapid-Standard introduced its Keystone line of overhead trolley conveyors, demonstrating in an operating loop gravity pick-off operations and changes in elevation. The No. 2 heavy duty trolley features six ½-in. ball bearings, with hardened steel construction and Zerk fittings.

Automatic control of conveyor lines was a key feature of the show. Among those demonstrated was the Dasac, a push-button electric control for routing materials over a predetermined course, by Dasol Corp. Automatic pallet-loading machines were demonstrated by Food Machinery & Chemical Corp. There were many displays of tote boxes made of metal, fiber board and glass-reinforced plastic. Another interesting glass plastic product, because it is produced by an extrusion method, was a crossbar for locking loads in boxcars. Reportedly the extrusion method makes the products, distributed by the Don W. Kelsey Co., competitive to crossbars of conventional materials, yet lighter and stronger.

Many devices for use at the loading dock were demonstrated. A hydraulic leveler to match a truck-trailer to the dock was emphasized by Rotary Lift Co. Dock boards of various materials, including magnesium, were shown by several makers.

A low-cost metal detector for protecting machines is sensitive to all magnetic metals, including manganese steels. Tramp metal on a conveyor causes the device to sound an alarm. The unit includes a search coil which is placed around the conveyor. Pre-engineered conveyor system components can be ordered and set up with



Army tank ventilating blower motor.

For applications where high torque is required at high speed.

out of proper design comes the right motor for your product

With a Lamb Electric properly designed motor you obtain the motor qualities which are important to the success of your product.

Exceptional performance and dependability are standard with Lamb Electric Motors, at no increase in cost, because they are "custom tailored" by personnel having many years of experience in this field.

We would like to discuss these advantages with you for *your* new and redesigned products.

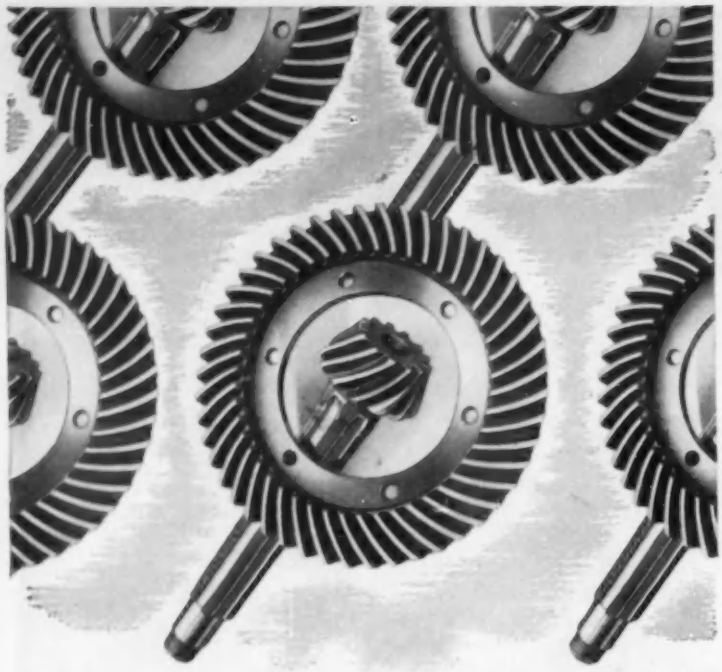
THE LAMB ELECTRIC COMPANY
KENT, OHIO
In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Question about tubing?

ask your Rochester Products
Sales Engineer about
GM STEEL TUBING

GM STEEL TUBING BY ROCHESTER PRODUCTS, DIVISION OF GENERAL MOTORS, ROCHESTER, N.Y.



Over and over again...

FAIRFIELD

SAVES YOU MORE ON TOP-QUALITY GEARS

Fine Gears Made to Order
for all manner of industrial equipment

SPIRAL BEVEL
STRAIGHT BEVEL
HYPOID
HERRINGBONE
HELICAL
DIFFERENTIALS
SPUR
WORMS AND WORM GEARS

• *Send for your copy of illustrated bulletin describing Fairfield's facilities for making gears.*

Fairfield is famous for repeat orders — and simply because quality is consistently high, and price is—well, just try to beat it!

How can Fairfield manage this unique position year after year? Truth is, it involves some tried-and-true mass-production methods plus some very special Fairfield ideas developed in the past 35 years of precision gear making.

Then, of course, Fairfield is ideally located with all facilities *under one roof.* Here you will find a complete metallurgical department, batteries of the most modern machines, testing laboratories, latest heat-treating equipment—all operated by skilled craftsmen working under expert engineering supervision.

There's another Fairfield service worth looking into—the expert recommendations on your particular gear problems. Your inquiry will receive prompt attention.

FAIRFIELD MANUFACTURING CO. for FINE GEARS

2303 SOUTH CONCORD ROAD • LAFAYETTE, INDIANA

a minimum of experience and effort, according to the display at the Lamson Corp. booth. This firm also showed its fork truck line.

Said to be the lowest-priced electric-hydraulic lift truck, the 1000-lb capacity Challenger was demonstrated by Big Joe Mfg. Co.

At the Conference, emphasis was on down-to-earth operating facts and experience data, for more efficient material handling. At the panel on warehousing, Bert Woldring of Rapid-Standard Co. advocated the concept of space allocation for mechanical accumulation. He mentioned the two conditions of storage, stop and go—goods being held stationary and goods on the move to and from the storage area. Much progress in mechanizing the go condition has been made, he said, but little has been done for the stop condition. Mr. Woldring described mechanical accumulators designed to add the principle of flow to stored items.

The panel on leasing agreed that the "true" lease is definitely safer as far as income-tax benefits are concerned, than a lease-purchase agreement, unless the purchase terms are based on fair market value at the time of purchase. F. J. Babcock of Universal Material Handling Corp. expressed this view in his talk and used the argument for leasing generally that if a company will lease (borrow) money to make a profit, it is just as logical to lease equipment for the same reason. Pride of ownership, he said, is sometimes costly.

Methods for improving old multi-story plants for more efficient handling received detailed attention from J. R. Bright of Harvard University. He outlined methods for organizing facts on such buildings, discussed travel charts as contrasted with conventional flow charts, and offered numerous ideas on horizontal and vertical handling, strengthening floors, improving shipping and storage.

"Better Materials Handling at Packard's New Plants" was the title of a talk by J. C. Anderson, materials handling engineer for Studebaker-Packard Corp. He pointed out shortcomings of the older setups and told what had been done to overcome them.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING

HAVE YOU HEARD ABOUT THE *Revolutionary New Motor* WITH DYNAMIC RESPONSE ?

The *New* Reliance Super 'T' Motor is the most revolutionary motor development in 40 years!

Whatever your application this new motor will do it better, faster—and require less machine or floor space.

Contact the nearest Reliance Sales Office—or write for Bulletin C-2002 which tells what Dynamic Response will do for *you!* C-1098

RELIANCE V★S DRIVE

RELIANCE ELECTRIC AND ENGINEERING CO.

1123 IVANHOE ROAD • CLEVELAND 10, OHIO
Canadian Division: Welland, Ontario

Builders of the Tools of Automation

RELIANCE Super T LINE

● When General Water Heater Corp., in Burbank, Calif., switched from hand spray to Ransburg No. 2 Process in painting water heater jackets, paint mileage increased almost 65%. Where General formerly got 370 square feet per gallon of paint, they now get over 610 per gallon.

On this installation, units ranging from 20 to 100-gallon size are painted with Ransburg No. 2 Process reciprocating disc atomizer. Changes in jacket sizes can be made without stopping the conveyor. With the reciprocating disc atomizer, change in stroke length is made "on the fly" without shutting down production. General also paints smaller parts, such as heater tops, bottoms, doors and legs, with the Ransburg equipment.

In addition to paint and labor savings, General Water Heater is getting "excellent consistency" and a high quality finish on their products. Another on-the-job-example of the unmatched efficiencies of the Ransburg No. 2 Process of electrostatic spray painting!

Ransburg maintains complete laboratory facilities for test-painting YOUR products under simulated production conditions. Why not let us show you what Ransburg Electrostatic Processes can do for you in YOUR finishing department. No obligation.

For further information about Electrostatic Painting Processes and complete Ransburg services, write Dept. A.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana
RANSBURG

AIRBRIEFS

(*Continued from page* 98)

was purchased by The Glenn L. Martin Co., one of the oldest and foremost aircraft manufacturers in the nation, for use as a light executive transport.

The *Chicago Tribune*, which purchased the first production model of the 5 to 7 place Commander, recently took delivery of a second similar plane. Other purchasers include General Mills, IBM, Maytag, Oliver and Magnolia. We wonder how many automotive concerns own and operate aircraft.

A Record 3 Million Pasengers

Scheduled airlines carried more revenue passengers during April, 1955, than in any other month in their history—three million of them. Previous high was 2,820,285 passengers carried in March of this year. For the first quarter the traffic is 21.7 per cent above that for the same period in 1954.

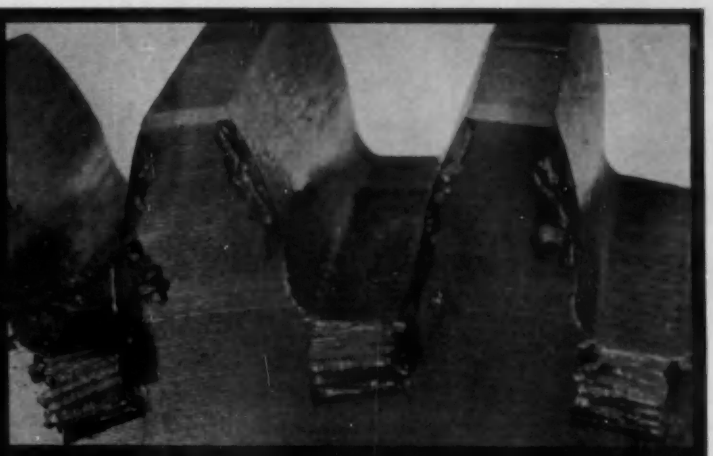
Earl D. Johnson, president of the Air Transport Association, in introducing the 16th edition of *Air Transport Facts and Figures* (published by ATA), recently stated that in the nine years since World War II, America's scheduled airlines have tripled their usefulness to the country.

Customers Join In Testing New Product

Five airframe makers have joined in conducting a series of tests on a new product of mutual interest. Convair, Douglas, Lockheed, North American, and Northrop formed a committee to specify and conduct two weeks of tests on a taper pin connector, a device for joining wiring to AN connectors without solder. The taper pin, manufactured for several years, is a development of Aircraft-Marine Products, Inc., Harrisburg, Pa. Tests were carried out at AMP laboratories. Observers included representatives of Amphenol, Bendix Scintilla, Cannon Electric, Arma Corp., IBM, Sandra Corp., Chance-Vought Aircraft, RCA-Victor, Hughes Aircraft, General Electric, Hazeltine Co., Glenn L. Martin, Melpar, and Republic Aviation. Taper pin-type AN connectors are now in use on missiles and target drone aircraft.

Osborn Brushamatic

. . . rough to finish in one operation



BEFORE BRUSHING. Edges have heavy burrs. Sharp corners permit high stress concentrations . . . possible sources for failure.

AFTER BRUSHING. Burrs are gone . . . smooth, uniform blend on junctures of gear face and involute increase tooth strength.

At the push of a button, you can now blend surface junctures on gear teeth . . . at the same time burrs are removed. Each gear tooth is uniform in quality. Production is less costly because it's simpler, faster.

Gears finished on Osborn Brushamatics are stronger, more dependable. By removing sharp corners, stress concentrations are avoided. Thus, there is less chance for failure in severe service.

Your operator simply loads and unloads the work. Brushamatic rotates the piece against revolving brushes on preset time cycles.

An **O**sborn **B**rushing **A**nalyst can show you how to put Brushamatic to work for you. One machine can handle a large variety of work . . . is easy to set up from job to job. Call or write *The Osborn Manufacturing Company, Dept E-30, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trade-Mark

OSBORN BRUSHAMATIC®. *Saves over 1000 manhours every year. Capable of handling over 2000 parts a day.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to February 9, 1955, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the March 15 issue, page 440, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period from February 10 to May 16, 1955.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AMERICAN SMELTING AND REFINING CO., South Plainfield, N. J.
Research and development—non ferrous metals—$1,243,786 (40)

BELL AIRCRAFT CORP., Fort Worth, Tex.
Military helicopters—$57,633 (60)

BOEING AIRPLANE COMPANY, Seattle, Wash.
Research and development of military aircraft—$841,818 (60)

BOEING AIRPLANE COMPANY, Wichita Div., Wichita, Kans.
Military aircraft—$116,056 (60)

BOEING AIRPLANE CO., Seattle, Wash.
Military aircraft—$1,551,500 (65)

DIECRAFT, INCORPORATED, Hereford, Md.
Military aircraft components—$526,500 (45)

DOUGLAS AIRCRAFT CO., INC., El Segundo, Calif.
Military aircraft—$452,161 (60)

DOUGLAS AIRCRAFT CO., INC., Long Beach, Calif.
Military aircraft—$147,803 (60)

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Military aircraft—$536,242 (65)

E. I. DU PONT DE NEMOURS & CO., Johnsonville, Tenn.
Titanium metal sponge—$40,000,000 (90)

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Engine Div., Deer Park, L. I., N. Y.
Military aircraft engines—$6,000,000 (20)

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Guided Missiles Div., Wyandanch, Long Island, N. Y.
Military aircraft—$223,984 (65)

GOODYEAR AIRCRAFT CORP., Akron, Ohio
Military aircraft parts—$235,931 (65)

KEARFOTT COMPANY, INC., Black Mountain, N. C.
Military aircraft components—$250,000 (60)

KEARFOTT MANUFACTURING CORP., Newark, N. J.
Military aircraft parts—$38,083 (65)

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Military aircraft—$340,625 (60)

THE RYAN AERONAUTICAL COMPANY, San Diego, Calif.
Military aircraft engine components—$59,779 (65)

SUNDSTRAND MACHINE TOOL CO., Aviation Div., Denver, Colo.
Military aircraft alternator drives—$5,204,179 (60)

THOMPSON PRODUCTS, INC., Cleveland, Ohio
Aircraft engine components—$1,566,142 (65)

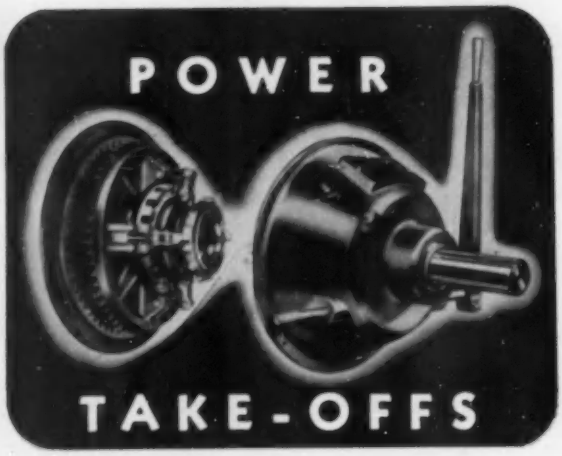
UNITED AIRCRAFT CORP., Pratt and Whitney, Aircraft Div., East Hartford, Conn.
Military aircraft—$150,000 (100)
Engines—$3,082,000 (65)

UNITED STEEL CORPORATION, Gary, Ind.
Electrolytic tin plate facilities—$8,500,000 (40)

WELLS AIRCRAFT PARTS CO., Los Angeles, Calif.
Aircraft parts—$237,000 (70)

WESTINGHOUSE ELECTRIC CORP., Kansas City, Mo.
Research and development—Turbo-jet—$7,246,916 (65)

ROCKFORD



A SIZE AND TYPE FOR EVERY USE

SELF CONTAINED UNIT
WIDE RANGE OF SIZES
CONSERVATIVE RATING
ROLLER BEARINGS
FINE ADJUSTMENT
ACCURATE BALANCE
S.A.E. DIMENSIONS

* ROCKFORD POWER TAKE-OFFS are available in standard sizes ranging from 125 foot pounds to 2100 foot pounds torque. Clutch sizes range from 6½ to 18 in. double plate. These complete, self-contained units are suitable for heavy-duty gear-tooth application to current industrial gasoline and diesel engines.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 315 Catherine Street, Rockford, Illinois, U.S.A. ▲

CLUTCHES

AUTOMOTIVE INDUSTRIES . . .

Is your News Magazine of Automotive and Aviation

MANUFACTURING

ENGINEERING
REPORTS:

G-E ENGINEERING SERVICES . . .

MAKE LABS MORE PROFITABLE THAN OPEN-ROAD TESTING

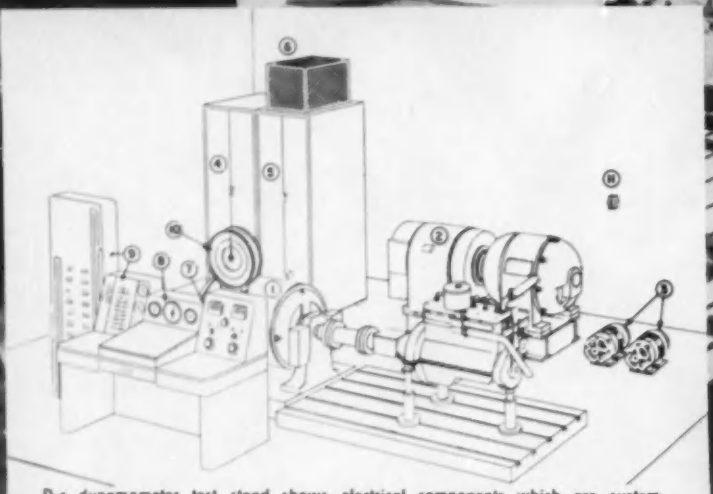
G-E engineering know-how helps you duplicate road conditions electrically in the laboratory. You benefit in three ways: (1) You cut the expense of test vehicles. No need to install and remove components—axles, transmissions, engines—on a test vehicle. No need to equip each vehicle with many sensitive measuring devices *just to test one unit.* This equipment installed in a lab gives precision results for a *number of units.* (2) You control all conditions. Conduct tests unaffected by outdoor weather. (3) Repeat tests at any time, duplicating all original conditions. There's less chance for human error.

The illustration shows a G-E engineer working with a Ford Motor Company specialist, conducting balancing tests on a G-E dynamometer installed at the dynamometer building of Ford's Research and Engineering Center. Call on G.E. to work with you to develop a system for your specific needs.

TURN PAGE FOR INDUSTRY PRODUCTS . . .

GENERAL ELECTRIC

ENGINEERING REPORTS:



D-c dynamometer test stand shows electrical components which are system-engineered for accuracy and versatility. You're assured precision regulation.

1. Dynamometer
2. Motor-generator set
3. Amplidynes
4. A-c control
5. D-c control
6. Control resistor (with cover when mounted on case)
7. Operator's dynamometer control panel
8. Tachometer
9. Engine panels
10. Dynamometer scale
11. Emergency stop push button

G-E SYSTEM ENGINEERED . . .

Dynamometers are accurate over wide speed,

You can conduct precision torque measurements or rugged endurance tests with G-E dynamometers. These systems are G-E engineered for high accuracy and versatility.

You're assured precision speed regulation because G-E amplidynes with electronic amplifiers can regulate steady state speed to ½% of any set speed between base and maximum—and ½% of base speed at speeds below base, for 100% rated torque change.

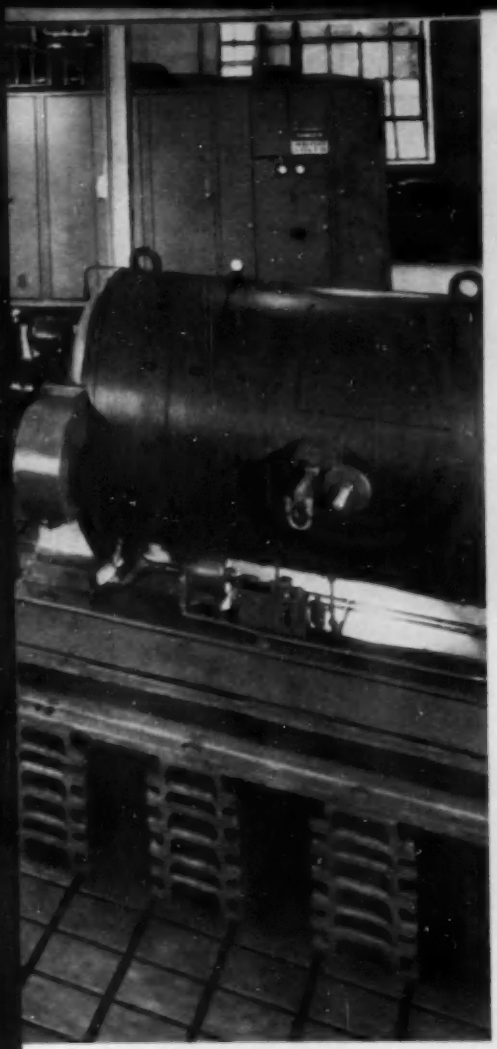
You can operate the d-c dynamometer with equal accuracy as a motor or as a generator. Fine adjustment is possible under running conditions, over a wide range of power, so that machines can be tested from minimum to maximum capacity without the necessity of frequent shutdowns.

Call on G.E.'s system and product engineering services to help answer your automotive test problems. General Electric's program of continuing research has resulted in dynamometers that match and anticipate advances in engine design, the demand for higher speeds, and lower system error.

For more information, contact your nearest G-E Apparatus Sales representative, or check coupon for Bulletin GEA-5923A.

Engineered Electrical Systems for the Automotive Industry

GENERAL ELECTRIC

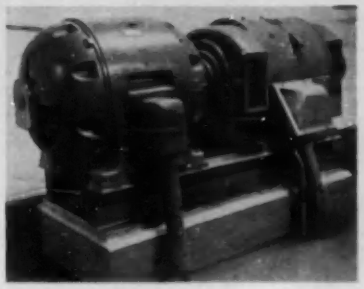


G-E SYSTEM ENGINEERS helped develop this rear axle test stand for the Timken-Detroit Axle Division's Alden Indoor Proving Ground.

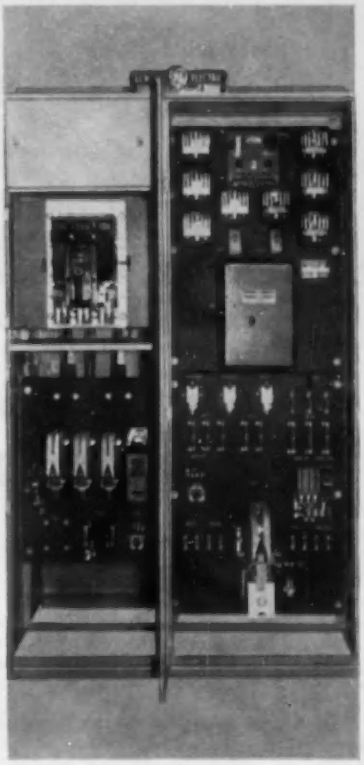
torque range

G-E PRODUCT ENGINEERING . . .

Assures reliable component performance



Dependable motor-generator set is one of the outstanding components which makes G-E dynamometer systems outstanding. It converts alternating current to a direct-current power supply—the basis for the system's extreme accuracy and flexibility. A pumpback control system allows the motor-generator to conserve absorbed power by returning it to the power line. High quality of design and manufacturing assures dependable operation.



Custom-built G-E system control panels are engineered specifically for each dynamometer installation. You benefit from the vast design experience of control specialists. They work closely with General Electric's system engineers to build panels which get maximum performance from, and maximum protection for, your dynamometer system.

The illustration shows the starter control for the motor-generator set—lower half of the left panel—with circuit breaker above the contactor.

The right side of the panel contains control for the other components of the dynamometer system. Included are protective devices to guard against overspeed and overvoltage of the dynamometer. Auxiliary motors for blowers and bearing lubrication are interlocked in the control circuits, so the dynamometer cannot be run if these motors are not functioning. These control components and others, such as ignition, reversing, field loss, or emergency stop relays, are compactly mounted on sturdy panels.

All control components are easily accessible for routine maintenance checks. Your nearest G-E Apparatus Sales Office will give you complete details on custom-engineered panels for any testing application.

CHECK COUPON BELOW FOR DESCRIPTIVE BULLETINS

General Electric Company
Apparatus Sales Division
Section 651-9
Schenectady 5, New York

Please send me the following bulletins describing G-E products for the automotive industry:

- ☐ GEA-5923A Dynamometer Systems
- ☐ GEA-6000 J.I.C. Speed Variator
- ☐ GEA-5968 High-slip Induction Motor

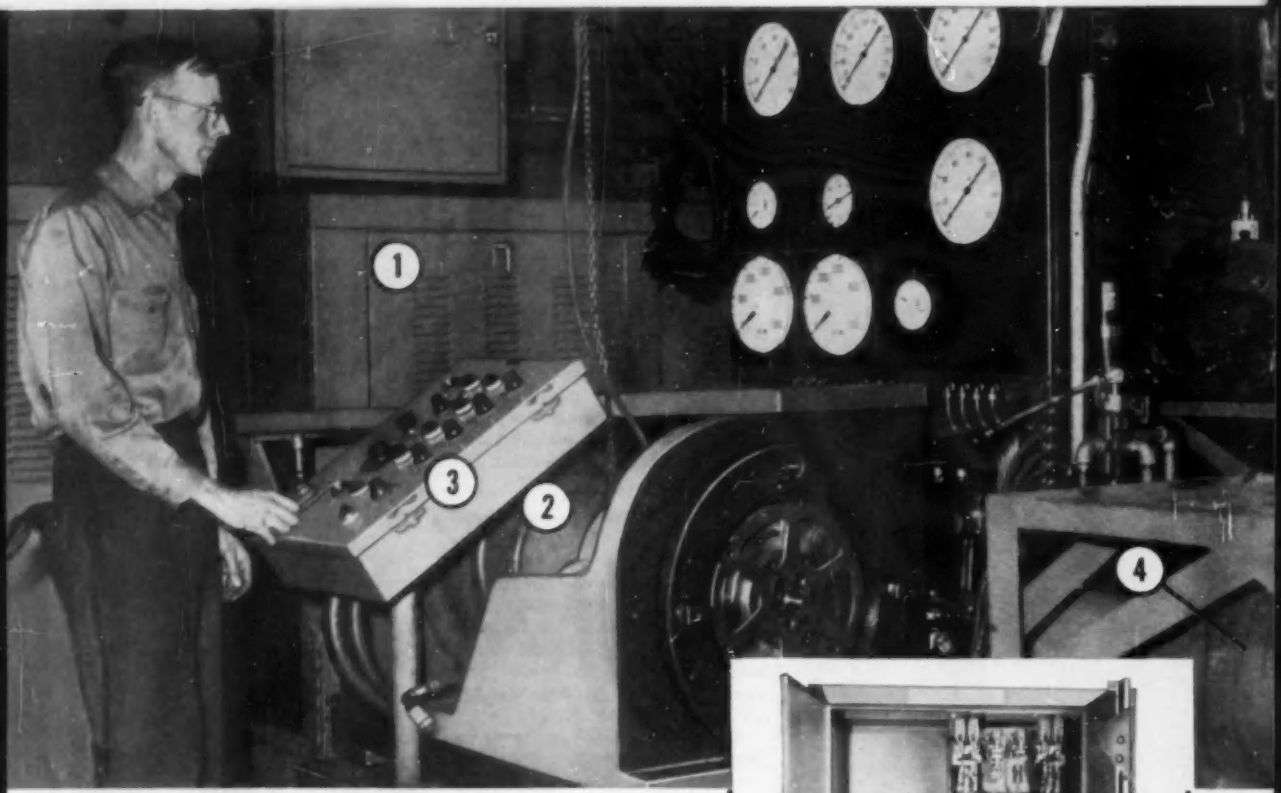
Name .....

Company .....

Street .....

City ..... State .....

TURN PAGE FOR MORE PRODUCT HIGHLIGHTS



G-E JIC SPEED VARIATOR on test stand of a leading automotive manufacturer. Compact power unit (1) in background, drive motor (2) underneath operator's control (3) and inductor dynomometer (4) lower right.

G-E product-engineering reports . . .

JIC Speed Variators give you precise power for parts testing

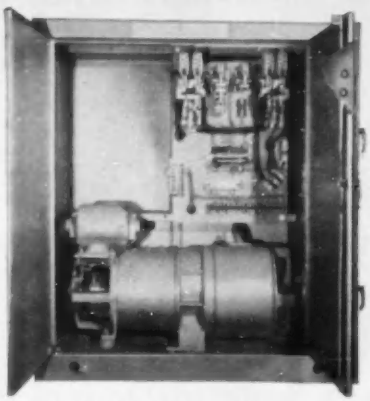
General Electric packaged JIC Speed Variators used to drive machine tools, conveyors and hoists in the automotive industry are also building a reputation for use in automotive component testing.

WIDE SPEED RANGES, precise speed regulation, speed of response, low maintenance and easy installation features of this *"packaged"* drive are ideal for driving transmissions, axles, differentials, etc., on test stands. Its extreme versatility helps you keep pace with new, higher-speed component developments.

IN TYPICAL TEST SYSTEM above, Speed Variators supply 30 hp continuously at 2000 to 5000 rpm under close regulation to a transmission. Output is measured, with or without load, by a G-E inductor dynamometer. The precise power and accurate measurement of G-E Speed Variators and Dynamometers allow you to simulate most road conditions and obtain accurate readings.

YOUR G-E SALE REPRESENTATIVE has complete information. Contact him at your nearby G-E Apparatus Sales office or write for a copy of GEA-6000, JIC Speed Variators. Section 815-4, Direct Current Motor and Generator Department, General Electric Company, Erie, Pa.

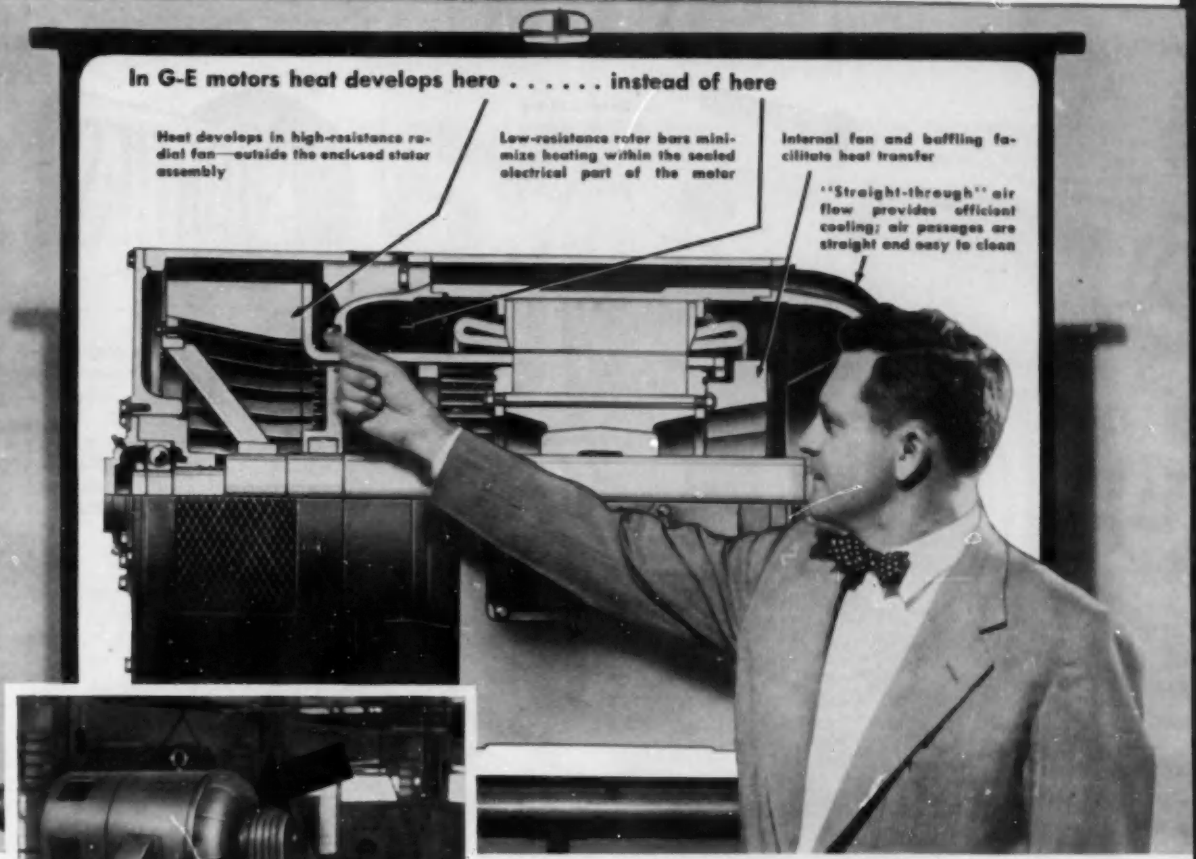
GENERAL ELECTRIC

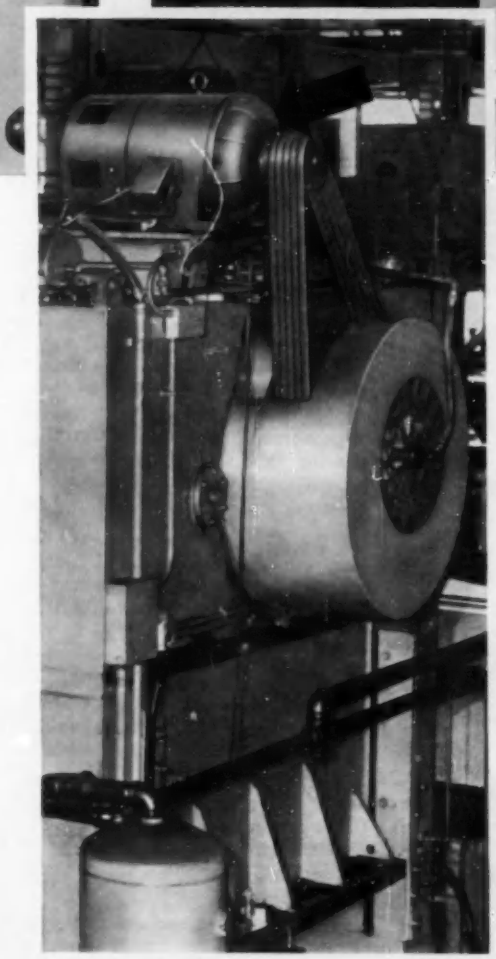


COMPACT POWER UNIT contains m-g set and all control. Needs no special foundation for installation and includes such JIC features as interlocked doors, positive ventilation system, and color-coded wiring.

DC DRIVE MOTOR, of rugged, totally enclosed construction, provides better protection against dirt, dust and contaminants.

OPERATOR'S CONTROL includes push-buttons and rheostat in NEMA 12 enclosure or components may be integrated with master control panel.


In G-E motors heat develops here . . . . . instead of here
Heat develops in high-resistance radial fan—outside the enclosed stator assembly
Low-resistance rotor bars minimize heating within the sealed electrical part of the motor
Internal fan and baffling facilitate heat transfer
"Straight-through" air flow provides efficient cooling; air passages are straight and easy to clean



Rugged, cast-iron frame and rigidly bolted end shields of the G-E Type KRX motor provide totally enclosed protection for your heavy-duty applications.

G-E PRODUCT ENGINEERING GIVES YOU . . .

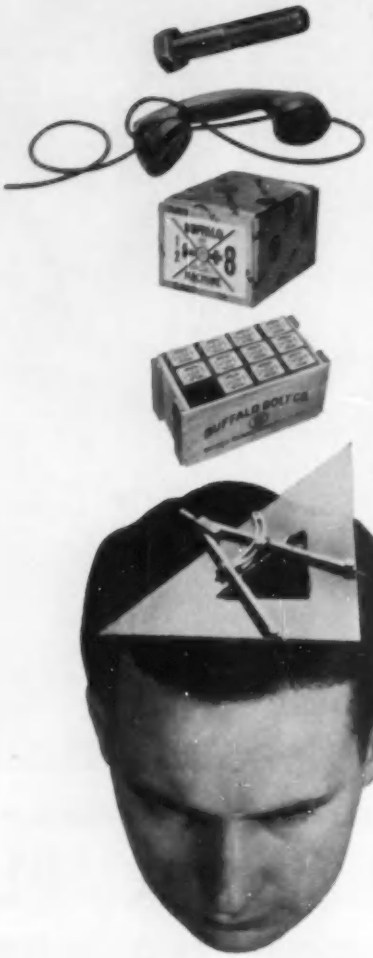
TOUGH, RELIABLE PRESS MOTORS

G.E.'s Type KRX motor is specifically engineered for your toughest heavy-duty press applications because it overcomes the rotor heat problem of conventional press motors. To dissipate the heat which develops in the enclosed stator of ordinary high-slip induction motors, larger frame sizes or blower and filter systems are required.

G-E engineers developed low-resistance rotor bars—as in a low-slip motor—to keep internal heat losses inside the stator assembly at a minimum. To secure the high-slip characteristics necessary for press motors, these rotor bars are extended through a running seal and brazed to a radial fan of high resistance material *outside* the totally enclosed electrical portion of the motor. Thus heat is dissipated readily by the external fans, making the KRX motor better suited for short time overloads or continuous performance at maximum capacity with less likelihood of failure. This system eliminates troublesome accessories, reduces handling, installation, and maintenance costs, and increases operating efficiency for longer service.

For complete details, write for Bulletin GEA-5968.

GENERAL ELECTRIC



he has **YOU**

on **HIS** *mind*

He's a key man in the Buffalo Bolt organization. It's his business to see that you get fast, accurate information on prices, deliveries or anything else pertinent to your fastener requirements.

Call him at your distributor, one of our branches, or at our factory and see for yourself why you get the finest and fastest service from Buffalo Bolt.

DISTRICT OFFICES

WESTERN OFFICE
Chicago
HArrison 7-2179

EASTERN OFFICE
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REctor 2-1888

CENTRAL OFFICE
North Tonawanda
JAckson 2400 (Buffalo)

BUFFALO BOLT COMPANY
Division of Buffalo-Eclipse Corporation
NORTH TONAWANDA, N. Y.
Making both FASTENERS & FRIENDS for 100 years

SHORTIES

The electrical circuits of a guided missile are so complex that they must be checked out before delivery by an electronic brain. The device itself contains six miles of wiring, 423 panel lights and 641 switch positions, thus enabling an engineer to check 90 different points in its mechanism.

•

A Pacific telephone company took to the air recently when stringing two miles of telephone wire across rugged hilly country. Instead of stringing wire by hand they hired a helicopter which did the job in one hour's time.

•

Four out of every 10 workers in the U. S. today are employed in mechanical or factory jobs.

•

A total of 101,236 gasoline pumps were installed in 400,000 primary and secondary service stations during the year 1954.

•

In 1954, civilian workers for Federal, state, and local governments in the U. S., reached an all-time high, more than seven million persons. The monthly payroll costs for this record number of workers was more than $2 billion.

•

Of the 57.7 million motor vehicles registered in the U. S. last year, 47.4 million passenger cars were driven an average of 10,500 miles each.

•

More than 24.7 million vehicles traveled over the 118-mile N. J. turnpike during 1954. These vehicles rolled up 929,323,912 miles of travel.

•

U. S. agriculture uses 16.6 per cent of all petroleum products in this country.

•

Diesel fuel demand has increased at a rate of about three times that of gasoline.

LIFE'S RUGGED...

UNDER IT ALL

YES, these heavy Diamond T trucks lead a rough life . . . body, engine, frame and chassis all subject to colossal strain, ever changing in character and extent with variations in speed, road surface, grade and curve.

And under it all, life is especially rugged for springs that soften the shock between axle and frame. To meet the exacting requirements of such springs is a significant accomplishment . . . yet on every day job for the Burton spring engineering and manufacturing plant and its experienced staff.

It's prudent business to entrust your spring requirements to people familiar with this specialized field of engineering . . . and to the modern equipment and scientifically controlled methods designed to translate this "know-how" into a depenable and uniform product.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

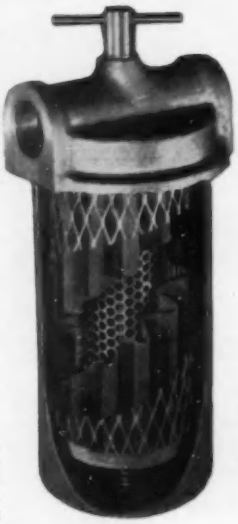
WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

MARVEL Synclinal FILTERS

For Efficient Filtration of—
Hydraulic Oils
Fire Resistant Hydraulic Fluids
Coolants — Lubricants
Water

SUMP TYPE
(cutaway)

Over 550
Original Equipment Manufacturers Install Marvel Synclinal Filters as Standard Equipment



LINE TYPE
(cutaway)

PROTECT EQUIPMENT
INCREASE PRODUCTION
REDUCE MAINTENANCE

Marvel Synclinal Filters installed in the sump or on the line preceding pump offer maximum protection on all hydraulically actuated and other equipment utilizing low pressure circulating oil systems. Maintenance and production costs are reduced because Marvel Synclinal Filters BALANCED design offers greater ACTIVE filtering area with sufficient storage capacity for filtered out damaging particles, thus, longer periods of productive operation are attained at minimum "down time" due to maintenance and repairs.

PRODUCTION ENGINEERS and MAINTENANCE MEN

whose job it is to keep production machinery operating at peak efficiency and who have recognized the superiority of Marvel Synclinal Filters in the filtration of hydraulic oils, fire resistant hydraulic fluids, coolants, lubricants, etc., are specifying Marvel Synclinal Filters on all new equipment and standardizing with Marvel Synclinal Filters on all machines within their plants.

Another outstanding reason for their preference is the simple construction of Marvel Synclinal Filters which allows them to be easily disassembled, thoroughly cleaned and reassembled on the spot, by any workman in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

MARVEL ENGINEERING COMPANY
625 W. Jackson Blvd., Chicago 6, Ill. Phone: FRANKLIN 2-4431

Catalogs containing complete data available on request

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated:

- ☐ Catalog #106—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog #300—For WATER
- ☐ Data on filters for Fire-resistant hydraulic fluids

Name .....
Title .....
Company .....
Address .....
City .....
State .....

AI-6

ON OUR WASHINGTON WIRE

Dominant position of air power is revealed again in new Defense Dept. list of 100 major prime contractors supplying equipment to the Armed Forces. First five companies named in the tabulation, covering the period July, 1953 through December, 1954, are: United Aircraft Corp.; Douglas Aircraft Co., Inc.; North American Aviation, Inc.; Boeing Airplane Co.; and Lockheed Aircraft Corp.

Profits after taxes of manufacturing corporations in 1954 held steady with the previous year at about $11.2 billion, despite a 14 per cent plunge in net before taxes. Federal income taxes declined 26 per cent last year, the joint SEC-FTC survey shows, to reflect the elimination of the excess profits tax.

Rise in two-car ownership is noted by the Federal Reserve Board. Over one out of four families with annual incomes of $7500 and up now drive two cars.

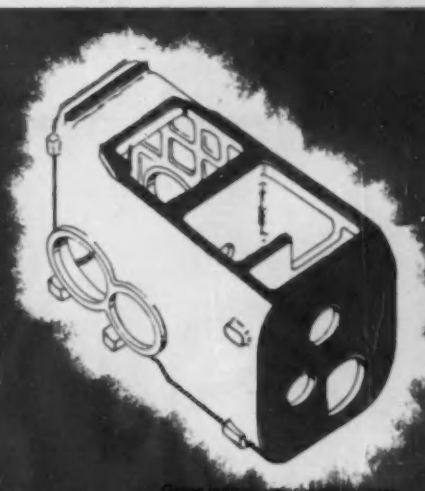
New study of chromium electroplating methods is described in a Rensselaer Polytechnic Institute research report. Now available through Office of Technical Services, Washington 25, D. C., it sells for $5.00.

Latest Navy flying development is found in helicopters operated by remote control. Kaman Aircraft Corp. built the prototype now being tested.

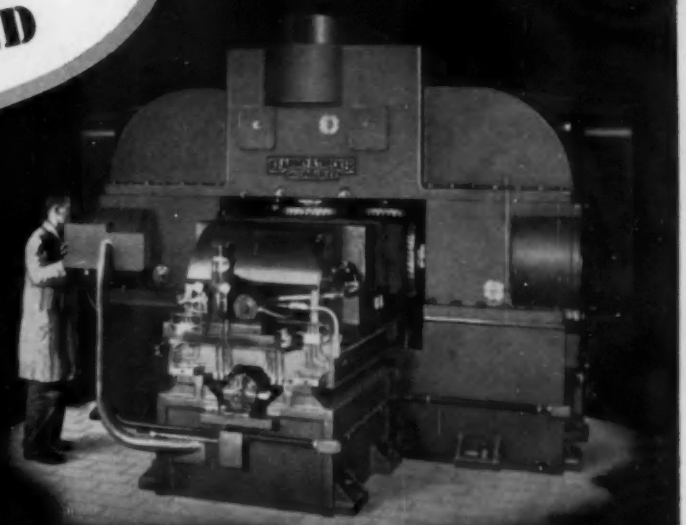
Scientific methods of selecting business reorganization, expansion, and sales methods, are suggested in a new, 62-page report sold by the Office of Technical Services, U. S. Commerce Dept., Washington 25, D. C. Entitled "The Application of Operations Research to Industry," the report (PB 111596) is priced at $1.75.

CUSTOMER SPECIFIED

One of the nation's famous-name farm machinery manufacturers required a big, high-speed, precision production milling machine which would mill several surfaces on huge, 625-lb. transmission case castings in a single setup.



KEARNEY & TRECKER MILWAUKEE DESIGNED



Kearney & Trecker's proposal was accepted and the result was this 44-ton, Five-Spindle Triplex machine which mills top, front and rear surfaces of tractor transmission cases at a rate of 23 pieces per hour.

Two horizontal spindles are mounted in duplex fashion and three vertical spindles on the massive bridge type head. Horizontal spindles, driven by 40-hp motors, carry 22" dia. cutters with 44 blades. Powered by a 50-hp motor, two of the vertical spindles have 22" dia. cutters and the third spindle a 6" dia. cutter with 12 tungsten-carbide blades.

New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

BOOTH NO. 505

For more details on machine illustrated ask for Data Sheet No. 1062. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

Hydraulic system for farming

Shown here, is an International Harvester McCormick *Farmall Tractor* equipped with the *Hydra-Touch* hydraulic system. The system is so compact that it can be almost completely enclosed in the tractor body. Dependable Bundyweld Tubing promises faithful performance here, as in other installations. Absolutely leakproof, Bundyweld takes easily to intricate fabrication operations; can be bent to shortest radii.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

equipment relies on Bundyweld for dependable performance

The use of Bundyweld Tubing in the *Farmall 400 Tractor* (shown at left), is a typical example of the type of engineering requirements that are successfully met when Bundyweld is specified for vital gas, oil, and transmission lines and other tubing lifelines.

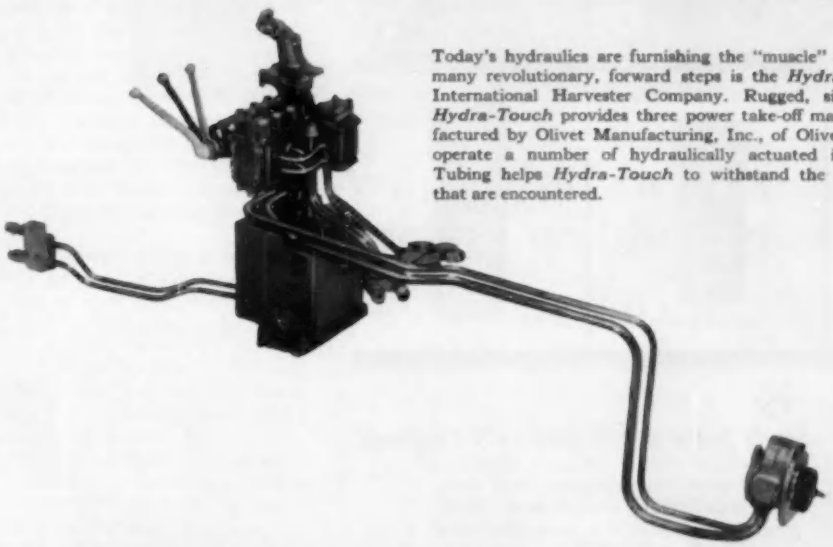
Manufacturers of farm equipment insist upon the proved dependability of Bundyweld, because their machinery must stand up under conditions of rugged terrain, bad weather, and strenuous use. These machines require sturdy tubing that won't leak, and can withstand heavy vibration fatigue and punishing wear.

Bundyweld is thinner-walled, yet stronger; it is leakproof by test, has high bursting strength, takes easily to standard protective coatings, and has a high fatigue limit. This quality tubing is double-walled, and copper-bonded through 360° of wall contact.

But you get more than quality when you deal with Bundy—for Bundy backs up the world's finest small-diameter tubing with the most advanced fabrication facilities, expert engineering help, custom packaging of orders, and prompt, on-schedule deliveries.

Follow the example of the hundreds of industrial leaders who use Bundyweld lifelines in their automobiles, trucks, buses and farm equipment. Call, write, or wire us, today.

BUNDY TUBING COMPANY
DETROIT 14, MICHIGAN



Today's hydraulics are furnishing the "muscle" on the farm. Typical of many revolutionary, forward steps is the *Hydra-Touch* system of the International Harvester Company. Rugged, simple, and dependable, *Hydra-Touch* provides three power take-off manifolds which are manufactured by Olivet Manufacturing, Inc., of Olivet, Michigan, and which operate a number of hydraulically actuated implements. Bundyweld Tubing helps *Hydra-Touch* to withstand the vibration and pressures that are encountered.

BUNDYWELD TUBING®

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • **Chattanooga 2, Tenn.:** Folsom-Deakins Co., 823-824 Chattanooga Bank Bldg. • **Chicago 32, Ill.:** Lapham-Hickey Co., 3333 W. 47th Place • **Elizabeth, New Jersey:** A. B. Murray Co., Inc., Post Office Box 476 • **Los Angeles 58, Calif.:** Tubesales, 5400 Alcoa Ave. • **Philadelphia 3, Penn.:** Ryan & Co., 1717 Sansom St. • **San Francisco 10, Calif.:** Pacific Metals Co., Ltd., 3100 19th St. • **Seattle 4, Wash.:** Eagle Metals Co., 4755 First Ave., South **Toronto 5, Ontario, Canada:** Alloy Metal Sales, Ltd., 181 Fleet St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

Balancing Engine Parts With Portable Analyzer

(Continued from page 102)

used for the various smaller parts.

With this setup and routine, Seagrave engineers have been able to fix vibration tolerances for each part. Thus corrections — or rejects when necessary — are made on the basis of exact knowledge of the extent and location of unbalance.

The table gives data on a partial list of the balanced parts.

The most spectacular money saving with the new setup has been in balancing the high pressure pump empeller. These impellers formerly were sent out, on a spot check basis, for custom dynamic balancing at a cost of $3 each. Now every one made is checked and balanced in the plant at an average cost of 14.6 cents.

Balancing of the Model E engine flywheel, which formerly took 6½ to 7 min on a static balancer, can be done in 5.55 min. Balancing the 500-gpm pump impeller now costs 19 cents against 26.6 under the former procedure.

The new system provided a further benefit in the engine water pump impeller. Engineers found that the degree of balance achieved not only produced smoother operation, but ended a problem of leaking seals. They had tried triple seals and an oversize shaft previously without complete success.

The key instrument in the Seagrave vibration analysis and dynamic balancing program is made by another Columbus firm, the International Research & Development Corp.

The IRD Vibration Analyzer, which can be used on parts rotating at speeds up to 160,000 rpm, is made up of a hand-held seismic pickup with filtering probe, a stroboscopic light, and a light-weight cabinet containing electronic circuits which take the vibration information gathered by the pickup and render it on panel meters showing displacement and frequency.

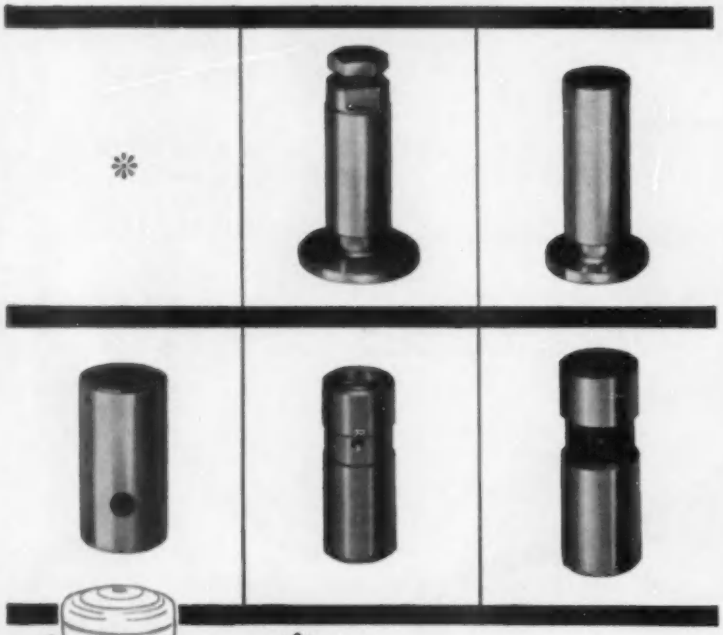
The operator, who need not have elaborate technical training, holds the pickup probe against the housing or mounting of the part being checked. On the Seagrave bench, the pickup is placed in tubular brackets, with the point of the probe resting on the bearing of the arbor on which the flywheel or impeller is being rotated.

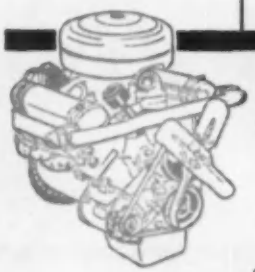
The pickup detects vibration of as little as 0.000001 in. displacement and converts the motion into electrical current to energize the electronic circuits.

The stroboscopic light, which the operator holds, is powered by the same current, and thus at the frequency of the vibration and the speed of the part involved. The stroboscope can also be powered by an internal oscillator at controllable speeds for use as a tachometer.

Use of the stroboscope provides a "window" to balancing operations by showing the phase or location of unbalance in the rotating part. A simple, four-step balancing operation, taking but a few minutes in most cases, has been developed with the instrument.

JOHNSON *tappets*





keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"tappets are our business"

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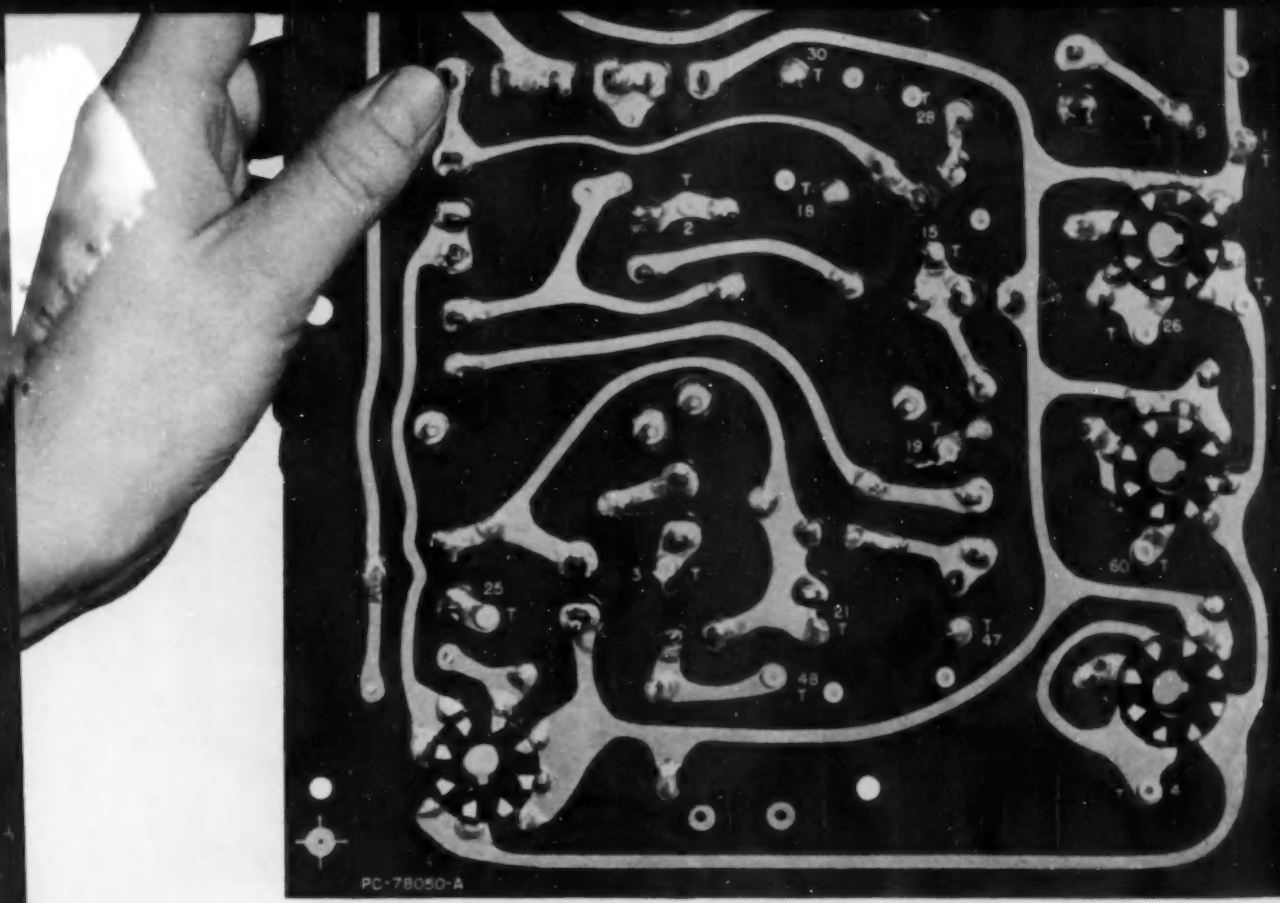
AUTOMOTIVE INDUSTRIES . . .

Is your News Magazine of Automotive and Aviation

MANUFACTURING



Now, printed circuits advance resistance welding control

In the new Weld-O-Timer,* Westinghouse is first to show major gains in control simplification

Look how easy it is to follow the circuit of this new Weld-O-Timer control panel. Would you believe it replaces as much as 27 feet of scrambled wiring? Startling facts such as this only serve to show the extent of complete redesign represented in the new Westinghouse Weld-O-Timer. On the following pages, see the developments that . . .

- **build more dependable performance**
- **achieve easier handling**
- **increase welder protection**
- **gain longer control life**
- **expand operating efficiency**
- **simplify maintenance**

*Trade-Mark

J-21886-1

YOU CAN BE SURE...IF IT'S

Westinghouse

Simplified, printed circuits . . . fewer components . . . build dependable performance

Dependability of the new Weld-O-Timer control begins with the fact that it starts life with all circuit paths complete . . . patterned from a master circuit plan that is printed on the control panel. By eliminating the conventional tangle of hand-soldered connecting wires, the chance for human error in manufacture is prevented. The front side of each panel is punched and clearly marked with the type, rating and location for each component, further simplifying the job of accurate assembly or replacement.

After assembly of components, a new Westinghouse dip solder method is used to obtain the tightest possible connection between component and circuit path. As panels are dipped in the solder bath at optimum conditions, no failing joints occur.

Design simplicity results, too, from an almost 50% reduction in tubes and other component parts in the Weld-O-Timer control panels.

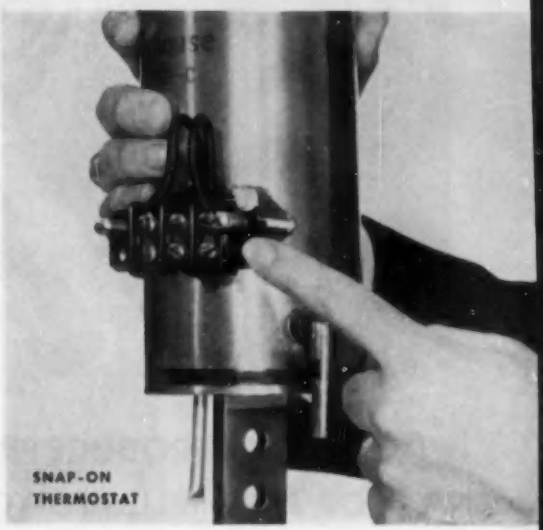
LONGER LIFE COMPONENTS

LIGHTER WEIGHT PANELS

Longer life components assembled on each control panel are rated for heavy-duty industrial work. For example, 600-volt capacitors are used even though circuit voltage is only 150 volts. Such extra quality cuts replacement costs by 20%.

Lighter weight panels handle easily. Printed circuit construction of each control panel reduces weight by 30%. The time required to carry or handle panels, even in cramped quarters, is reduced. New heavy-duty industrial plugs make fast, safe connections.

Snap-on Ignitron tube thermostat improves welder efficiency and gives protection from high operating heat. It is snap mounted to an inner temperature registering plate and set to lock out the current should dangerous heat build up. For more efficiency, a similar thermostatic switch can be installed on the second Ignitron tube to regulate and conserve cooling water.



SNAP-ON THERMOSTAT

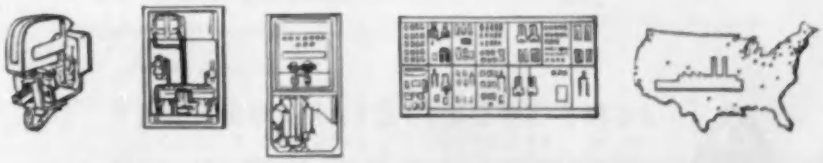
You can get all the facts on the new Weld-O-Timer from your Westinghouse sales engineer. Ask him for the new Weld-O-Timer book, B-6533, or write, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21886-2

YOU CAN BE **SURE**...IF IT'S

Westinghouse

FROM INDUSTRY'S MOST COMPLETE LINE OF INDUSTRIAL CONTROL



CONTROL COMPONENTS • MOTOR CONTROL • ELECTRONIC CONTROL • CONTROL SYSTEMS • NATIONAL SERVICES

Parts for this piston and sleeve assembly were mated and lapped to a precision fit. Clearance tolerances were maintained on the assembly to less than .00006". Inside diameter, concentricity and grooves were also held to very close tolerances.

ACME CAN PRODUCE PRECISION PARTS OR ASSEMBLIES TO YOUR ORDER

Acme will produce, to your specifications, finished hardened and ground parts from ferrous or other materials, complete from raw stock or from your semi-finished parts, in quantities from one to a million pieces.

Parts can be produced as individual pieces or as assemblies, with or without pistons. Tolerances to within .00001" or less, and corresponding micro-inch finishes can be maintained.

Acme's modern plant contains over 250 metal-working machines and 150 pieces of laboratory testing and inspecting equipment. Services include complete machining, heat treating, grinding, lapping and honing operations.

For over 35 years Acme has been producing hardened and ground parts for thousands of satisfied customers.

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Manufacturers of standard dowel pins • Chamfer micrometer gages • Drill jig bushings • Portable bench centers • Roughness comparison specimens • Hardened and ground parts manufactured to order

Fokker Planes

(*Continued from page* 49)

The manufacture at the Galeão plant refers to the construction of the airframe, while the engine, instruments and special parts, such as the landing gear, will be bought abroad which would be the same as is done by Fokker Amsterdam. In addition to this the contract requires Fokker Rio to supply five machines S.11 and five machines S.14 to be produced in components by Fokker Amsterdam and to be assembled by Fokker Rio.

As to the supply of the first aircraft S.11 to be built by Fokker Rio, a delivery period of 21 months, after the coming into effect of the contract, was established. In connection with the starting problems a manufacturing period of 14 months had to be taken into account, preceded by a period of preparation which was estimated at about seven months. Owing to special circumstances, related with the financial situation, there has been a delay of about five months, so that the first Rio constructed S.11 aircraft will not be delivered until about November, 1955, preceded by the supply of the five S.11 aircrafts in components from Amsterdam.

Ausco Method for Casting Packard V-8 Crankshafts

(*Continued from page* 69)

Since there is considerable interest today in cast crankshafts, a few comments may be appropriate as to the advantages of the process. In the first place, it is pointed out that the foundry method provides a wide latitude for design engineers. The location of counterweights, crankpin lightening holes, and flanges is extremely flexible. Relatively close tolerances inherent in the process hold stock removal to a minimum, and hot straightening is said to result in cranks that are straight at the start, with no locked up stresses to interfere with machining or operation in an engine.

Finally, it is pointed out that accurately controlled metallurgy combined with electric furnace melting methods makes it an easy matter to fit the metal composition to any engineering specifications for cranks exhibiting high tensile properties, durability, and high wear resistance.

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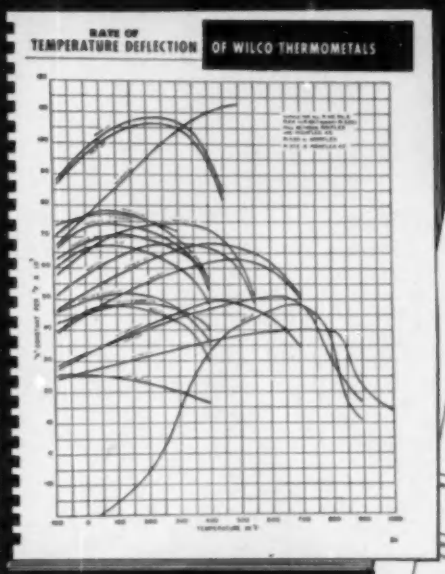
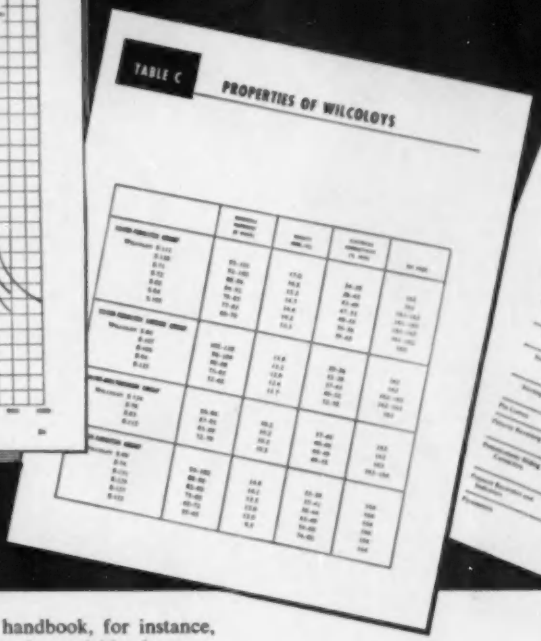
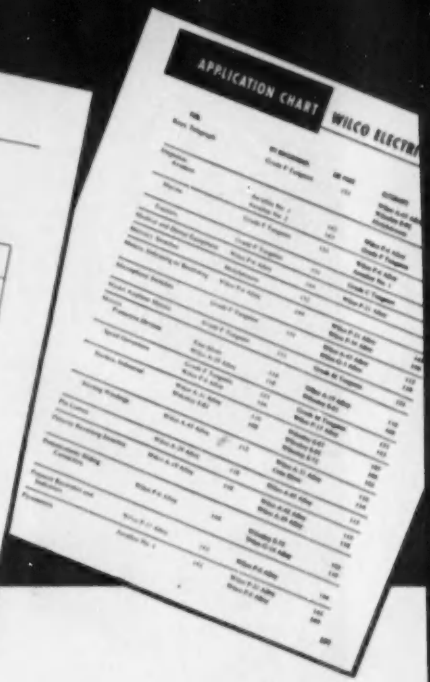
IT'S READY FOR YOU!

The WILCO Blue Book—the most complete reference manual ever written on Thermometals, Electrical Contacts, Composite Metals, and Special Purpose Alloys







It shows you how
It helps you select
It saves you time

In the Thermometals section of this handbook, for instance, are 100 charts to enable you to determine quickly the type, size, shape, and fabrication of the thermometal best suited to your application. Detailed formulae for estimating the behavior in each application save still more of your time.

In 4 Sections for Ready Reference:

1. THERMOMETAL (Thermostatic Bimetals). All temperature ranges, deflection rates, and electrical resistivities.

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This 192-page "Blue Book" is designed with one chief aim—to save you time. There has never been a reference book on these metals remotely comparable to it for completeness. There is no better way to select the correct material than with the Wilco Blue Book combined with Wilco Engineering Service. Qualified personnel may obtain a copy free by writing on their company letterhead. For advice on a specific problem, ask for Wilco Engineering Service.

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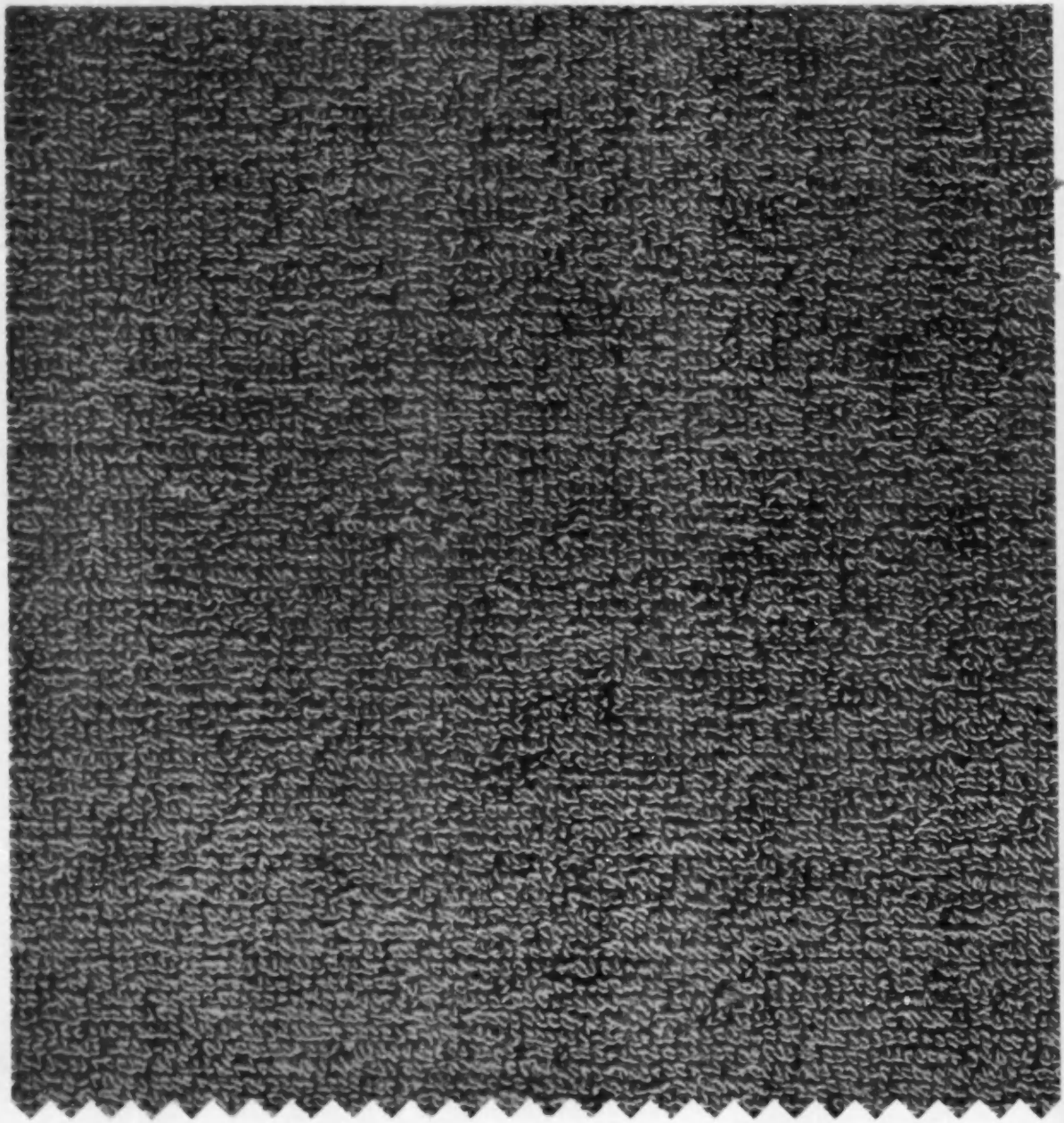
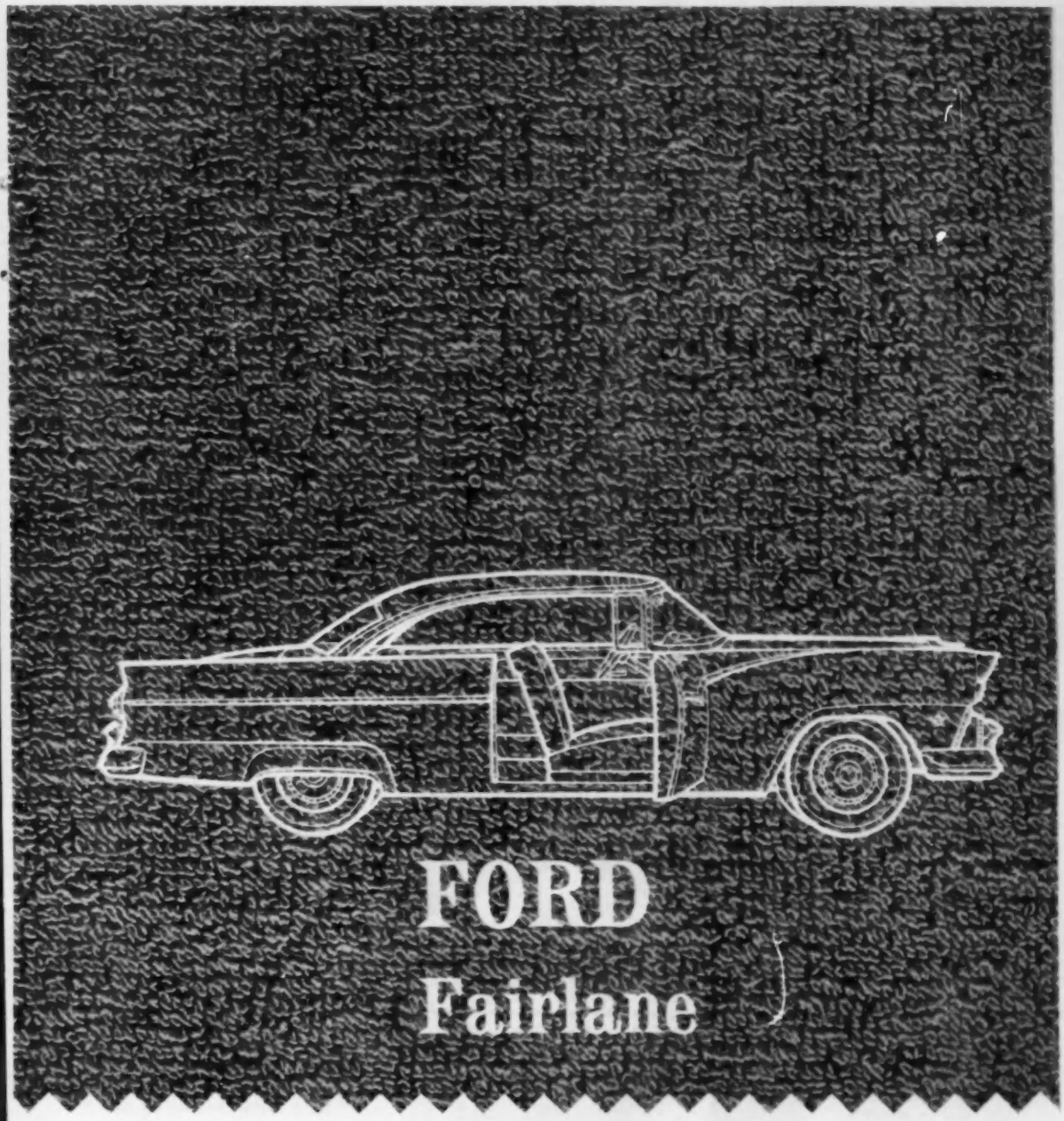


carpeting by Masland and by Mohawk . . . a blend using



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Introduced less than a year ago, the NEW Nylon Staple by IRC is already in important use in America's most important industries. The biggest names in the automotive field are featuring blended carpeting using this uniquely different staple. Leading mills report that it is a better nylon staple in many ways. It has seven new and distinctive features capable of producing new and better effects.

- **MORE RESILIENCY** *with less* **CRUSHABILITY** • **GREATER STRENGTH**
- **BRIGHTER LUSTER** • **BETTER CRIMP** • **GREATER RESISTANCE TO ABRASION**
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The BUSINESS PULSE

(*Continued from page 96*)

is no prospect of any material rise over the near term in steel tonnage, but rather, because of the approaching vacation season, the probability of some backsliding. Recent month-to-month gains, it is worth noting, in terms of the utilization of capacity, have been perceptibly smaller than in the earlier stages of the business upswing. However, new orders through May reportedly continued to exceed production, so the prospect is that activity will remain excellent for several more months, even if demand by automobile manufacturers does fall off.

If the labor issues are peaceably resolved, automobile production may conceivably continue at high levels well into the third quarter, since sales experience has been favorable. But no further increase from present high levels is in prospect, and some decline is almost certain to occur, if only because of seasonal factors and preparations for changeovers. This means that the automobile industry will probably not impart any further impetus to business for some time to come, although it is likely to be an important sustaining factor. As a matter of fact, the industry for some weeks past has not been characterized by the vigorous expansion which typified the earlier stages of the business upswing.

Construction Levels Off

There is evidence that construction, like steel and automobiles, is beginning to level off. Total outlay for new construction still appears to be rising moderately on a seasonally adjusted basis, but recent monthly gains have not matched those of the winter period. In the field of residential nonfarm construction, there actually appears to be some likelihood of at least a slight decline in total outlay in coming months, since private nonfarm housing starts are now showing some tendency to edge lower. In April they ran at a seasonally adjusted annual rate of 1.3 million units, about 100,000 lower than in the final quarter of 1954 and the first quarter of this year.

But while the phase of vigorous expansion may be at an end for the present, there is little immediate prospect of significant recession in construction activity. This is because of the continuing large volume of contracts being awarded. In the first four months of the year construction contracts awarded in 37 eastern states, as reported by the F. W. Dodge Corp., totaled $7.5 billion, 35 per cent above the comparable amount in 1954. With seasonal factors taken into account, the absolute dollar volume of contracts was better at the end of this period than at the beginning, although the rising tendency from month to month was not as pronounced as the upsurge last autumn. A significant aspect of recent contract data is the strength of the heavy-construction category. This strengthens the hope that an uptrend in plant investment is in fact materializing. This, of course, could be of importance in offsetting any slackening that may occur in the residential sector.

While the foregoing tendencies seem to point to a moderation of the business rise, other data afford promise that the business situation has firm underpinnings. Very much in point on this matter is recent infor-

• AUTOMATIC RESET CIRCUIT BREAKERS
• DIRECTIONAL SIGNAL FLASHERS
• HYDRAULIC STOPLIGHT SWITCHES
• LOW-PRESSURE INDICATING SWITCH
• "SERIES 400" PRESSURE SWITCHES

The "Extras" that became "Regulars" on America's Leading Cars and Trucks

FASCO AUTOMATIC RESET MOTOR PROTECTOR.

NEW! FASCO LOW PRESSURE OIL INDICATING SWITCH.

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FASCO DIRECTIONAL SIGNAL FLASHER.

As progressive changes and new developments have been made by the automotive industry, Fasco, over the years, has responded with products specifically designed and built to meet exacting industry needs... and will continue to respond with "look-ahead" designs to meet the challenges of tomorrow!

So whatever your current or future requirements may be... it always pays to CONSULT FASCO... FIRST!

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Straight facts about centrifugal castings!

Get this new booklet, "One Source," that tells the story of centrifugal casting manufacture! Read how creative engineering and advanced metallurgy at Campbell, Wyant and Cannon assures a more uniform, denser structure for electric furnace alloys resulting in longer-wearing, easier-to-machine castings. In addition to information on centrifugal castings, it contains interesting data on all of the subjects listed below. Send for your free copy now!

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GRAY IRON, ALLOY IRON AND STEEL CASTINGS

- Intricate Castings
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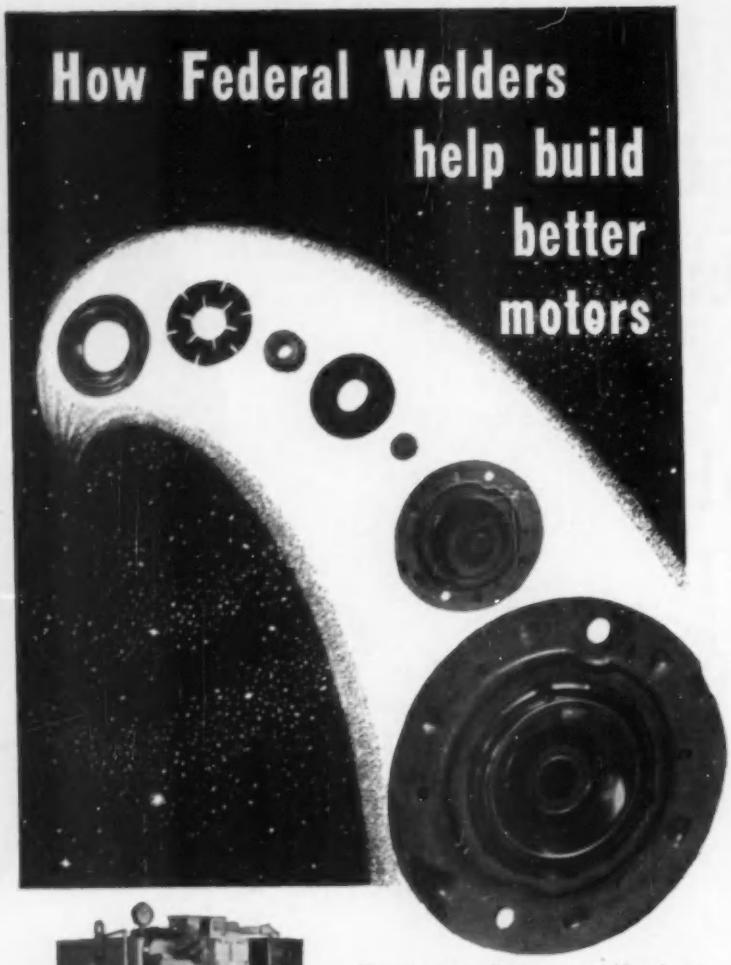
How Federal Welders help build better motors



To get more efficient assembly of an end head on a fractional horsepower motor, a leading automotive parts manufacturer came to Federal. The result — a standard Federal Bench Type Projection Welder with a special 8 station dial feed operated through a Geneva motion drive that completes 1600 assemblies per hour.

Federal uses a Reeves drive arrangement operating through a gear box to permit flexibility of adjustment of indexing rate. The die slide is spring loaded to insure identical weld force at each station. The manufacturer finds this welder gives a more uniform motor end head, in greater quantities, at reduced costs.

This is another example of how Federal's resistance welding "know how" is paying dividends to one of America's leading industrial concerns. Why not, when next you're considering welding, call *Federal — First in Resistance Welding.*

Federal WELDERS

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THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

mation relating to trade and to the labor market.

Retail Trade Up

Total retail trade in April amounted to $15.5 billion, which was seven per cent greater than in April, 1954, and one per cent greater than in March of this year, on a seasonally adjusted basis. Automobile sales continued to be the main contributor to the large volume, but actually the outstanding feature of the month was the strong showing of nonautomotive trade, which had tended to recede slightly in the earlier part of the year. The good showing of nonautomotive trade is heartening, for it stimulates the hope that over-all trade will be well maintained if and when a seasonal downturn occurs in automobiles.

Perhaps the most encouraging development of the recent past has been improvement in the labor-market situation. Between March and April a sharp rise occurred in total employment, the most important aspect of which was a vigorous and diversified rise in factory employment. As a result of the month's favorable employment experience, the jobless total fell by another 200,000, even though unusually large numbers of job seekers entered the labor market. Unemployment is estimated to have fallen to 2,962,000, marking the first time since December, 1953, that it has been under the three-million level.

MACHINERY NEWS

(*Continued from page* 79)

Sundstrand Machine Tool Co., Rockford, Ill., recently completed a new plant at Belvidere, Ill. The facility of 29,000 sq ft will be used primarily for large Rigidmils, special machines, and transfer type equipment.

Brad Foote Gear Works, Inc., Chicago, has added new gear cutting and testing equipment. Spiral bevel gears with a pitch diameter up to 66 in. in a 10 to 1 gear ratio with face widths up to 10 in. can be cut and tested on the new machines.

Michigan Tool Co., Detroit, has developed a super line of high production Shear-Speed gear shapers. According to Marvin R. Arderson, executive vice-president, the new line provides manufacturers with a process for producing large gears faster than any known method of production. A 20 in. diam, 3 D. P., six in. face width gear can be produced in 13 min.

You get the machining qualities you want when you use J&L's LEADED STEEL BARS

1. FASTER MACHINABILITY . . . because with J&L's Leaded Steels much higher cutting speeds are possible.

2. INCREASED TOOL LIFE . . . because the lead addition in J&L's Leaded Steels lowers the coefficient of friction—thereby reducing the heat that develops in the cutting edges of tools.

3. IMPROVED SURFACE FINISHES . . . because J&L's Leaded Steels machine to fine surface finishes.

4. LOWER OVER-ALL COSTS . . . because the free-cutting qualities of J&L's Leaded Steels boost production and, at the same time, reduce part rejections.

Phone the J&L District office or Warehouse nearest you.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
Pittsburgh 30, Pa.

MEN *in the* NEWS

(*Continued from page* 106)

AC Spark Plug Div., General Motors Corp.—**Gordon T. Ersted** has become military sales representative to deal with aircraft engine manufacturers.

American Metal Products Co.—**Andrew M. Mras** has been elected executive vice-president.

Square D Co., Industrial Controller Div.—**James F. Magin** has been appointed general manager.

Texas-U. S. Chemical Co.—**Thomas A. McCoy** has been named manager.

Heintz Mfg. Co.—**John C. Leutwyler, Jr.**, has been appointed sales manager.

Dodge Div., Chrysler Corp.—**Bertram M. Carter** has been promoted to new car sales manager.

Nash Motors Div., American Motors Corp.—**R. James Molloy** is now sales promotion manager; **Allen D. Gage**, national advertising supervisor; **E. B. Brogan**, local advertising supervisor; and **John H. McGuckin**, sales training supervisor.

Ford International Div., Ford Motor Co.—**Donald E. McKellar** has been appointed advertising and sales promotion manager.

Republic Aviation Corp.—**Walter G. Bain** has been elected to the board of directors, and **Ken Ellington** has been named a vice-president.

Ajax Flexible Coupling Co., Inc.—**Wayne Belden** was elected president; **Charles W. Belden**, vice-president; **Harley E. Northrop**, treasurer; and **Robert G. Cady**, secretary.

Chrysler Div., Chrysler Corp.—**C. P. Noonan** has been named sales manager.

Precision Div., Micromatic Hone Corp.—**Frank J. Hoder, Jr.**, was named general manager.

Clark Equipment Co.—**C. H. King** and **D. H. Ross** have been elected directors.

Wagner Bros. Equipment Co.—**Steve Jerome** has been appointed general manager.

Solar Electric Corp.—**Walter J. Dremann** has been named president.

Bell Aircraft Corp.—**Joseph J. Conners** has been appointed an assistant vice-president.

Greer Hydraulics, Inc.—**G. Lawton Johnson** has been elected to the board of directors.

Fairchild Engine & Airplane Corp.—**Edwin A. Speakman** has been elected a vice-president.

Ex-Cell-O Corp.—**E. J. Giblin** was appointed assistant treasurer, and **R. C. Stein** was named assistant secretary.

Conforming Matrix Corp.—**Milton T. Schimmel** has been named general manager, and **Gerald D. Minnick** was made plant superintendent.

Chrysler Div., Chrysler Corp.—**C. A. Robitaille** has been appointed fleet sales manager.

Ethyl Corp.—**William McK. Spierer** has been made sales promotion manager.

International Nickel Co. of Canada, Ltd.—**Ralph D. Parker** has been elected vice-president, and **Walter A. McCadden**, comptroller.

Chrysler Corp., Automotive Body Div.—**Leo J. McPharlin** was named purchasing agent.

Mercury Div., Ford Motor Co.—**R. R. Nadal** has been named assistant general sales manager of marketing; **R. W. Chambers**, marketing manager of sales planning; **J. R. Maroni**, marketing manager of dealer planning; **T. Jack Henry**, assistant general sales manager of advertising, sales promotion, and training; and **J. J. Szeregnyi**, assistant advertising manager.

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Roto-Finish processes are controlled precision finishing operations using low cost mass production techniques, which maintain exact tolerances on most any size or shape precision part with no significant dimensional changes. Roto-Finish speeds production, cuts maintenance expense, minimizes operational costs, yet produces top quality finishing results. Roto-Finish offers latest in controlled methods, materials and special purpose fixture equipment. Roto-Finish is your new opportunity in controlled precision finishing with guaranteed results!
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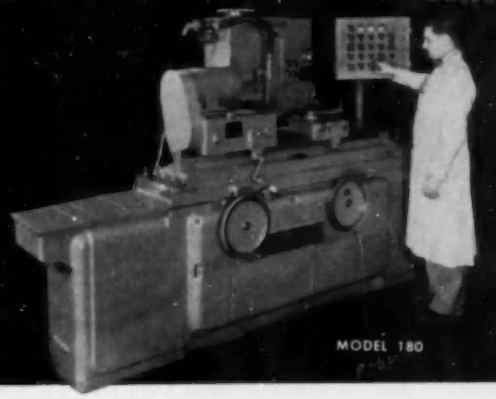
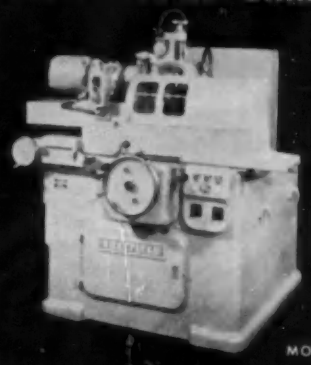
June 20 - 23 at Cleveland Public Auditorium

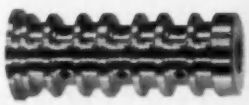
Grind PRECISION FORMS, GROOVES and LANDS *in Record Time* with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS

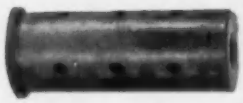


MODEL 180



MODEL 109



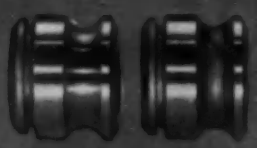


Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 810, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

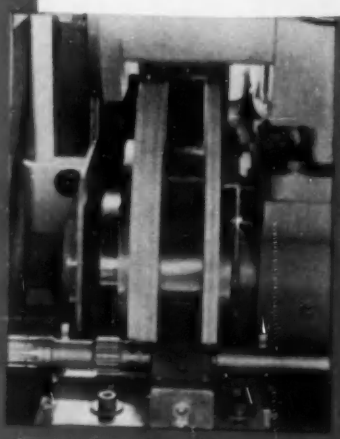


Bearing Race

Aircraft Servo Component

Hydraulic Servo Units

Self-aligning Bearings



Grinding Grooves in a Transmission Shaft

Crushtrue Roll

See this at the Machine Tool Show, Booth 1205.

SHEFFIELD HEADQUARTERS

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Whatever your furnace needs for control—

There's good reason why more heat-treating furnaces everywhere are controlled by Brown instruments. First, of course, is performance . . . sensitive, precise control that meets the most exacting requirements of modern heat-treating techniques. And equally important is versatility. In this varied line of instrumentation you'll find just about everything a furnace could possibly need in the way of control.

Choose *ElectroniK* Strip Chart Controllers for detailed, long-term records . . . and a selection of control forms including electric systems of the contact, position-proportioning (*Electr-O-Line*) and time-proportioning (*Electr-O-Pulse*) types; and pneumatic control from two-position to full proportional-plus-reset-plus-rate action.

Choose *ElectroniK* Circular Chart Controllers for ease of scale reading . . . convenient daily charts; in a full range of electric and pneumatic control forms.

Note: the basic components of all *ElectroniK* models are interchangeable . . . to simplify and speed up service.

Choose *ElectroniK* Circular Scale Controllers where you want readability and control check at extreme distance . . . without need for a record. Supplied with all contact and proportional types of electric control.

Note: all *ElectroniK* models are available in both Standard and Precision Series.

Choose *Pyr-O-Vane* Controllers where you don't need a record but do need precise vane type snap action electric control by a millivoltmeter instrument... alsoavailable with pulse-type time proportioning action, in both vertical and horizontal models.

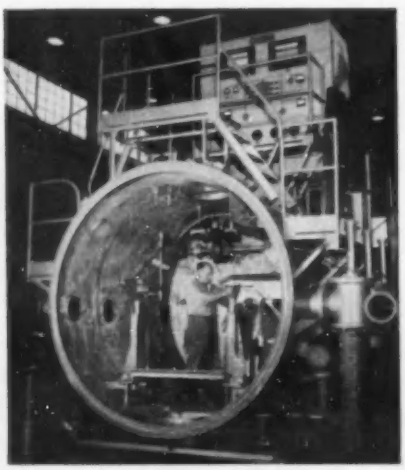
Choose the *Protect-O-Vane* Safety Cut-Off for simple, dependable excess temperature protection ... can be used with any temperature control to prevent furnace shut downs and loss of production.

• • •

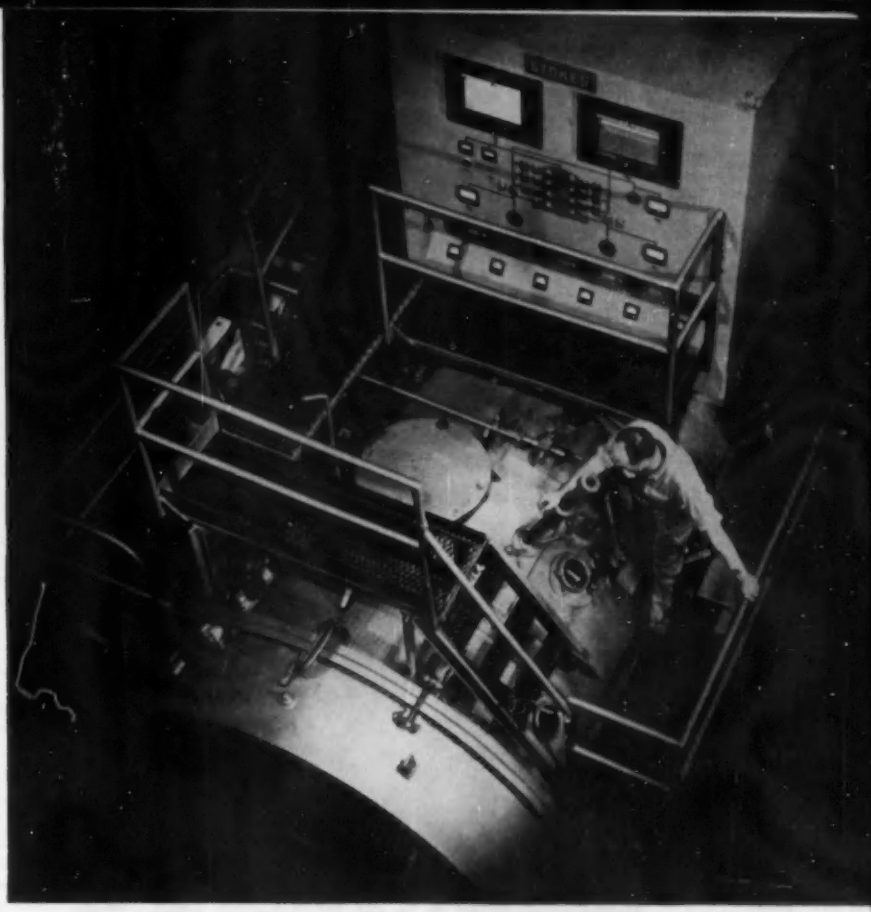
And for all your pyrometer supplies, investigate the convenience and economy advantages of the HSM Plan.

ElectroniK

instruments aid production of jet engine



View of the interior of the vacuum chamber.



This 1000-lb. capacity Stokes vacuum furnace is the largest ever built for melting and centrifugally casting high temperature alloys. On panel at top of the furnace are ***ElectroniK*** *instruments for temperature and vacuum measurement.*

blades in Stokes vacuum furnace

VACUUM METALLURGY is opening the way to new standards of high-temperature strength for specialized jet engine alloys. Notable among the developments in this fast growing field is the Stokes vacuum furnace, made by F. J. Stokes Machine Co. Heating, melting, alloying and even casting operations are all performed under vacuum inside the furnace chamber. Due to the exclusion of air, the harmful effects of dissolved gases and inclusions are eliminated. Costly alloying ingredients are not lost through oxidation.

The net result is that vacuum-processed parts generally exhibit substantially higher physicals at the extreme temperatures for which jet engine designers are planning. To obtain these benefits, accurate measurement is demanded. A pair of *ElectroniK* instruments do the job. One records furnace temperature . . . the other, furnace vacuum. Together they provide data necessary in holding this unique process exactly at specified conditions on every production heat.

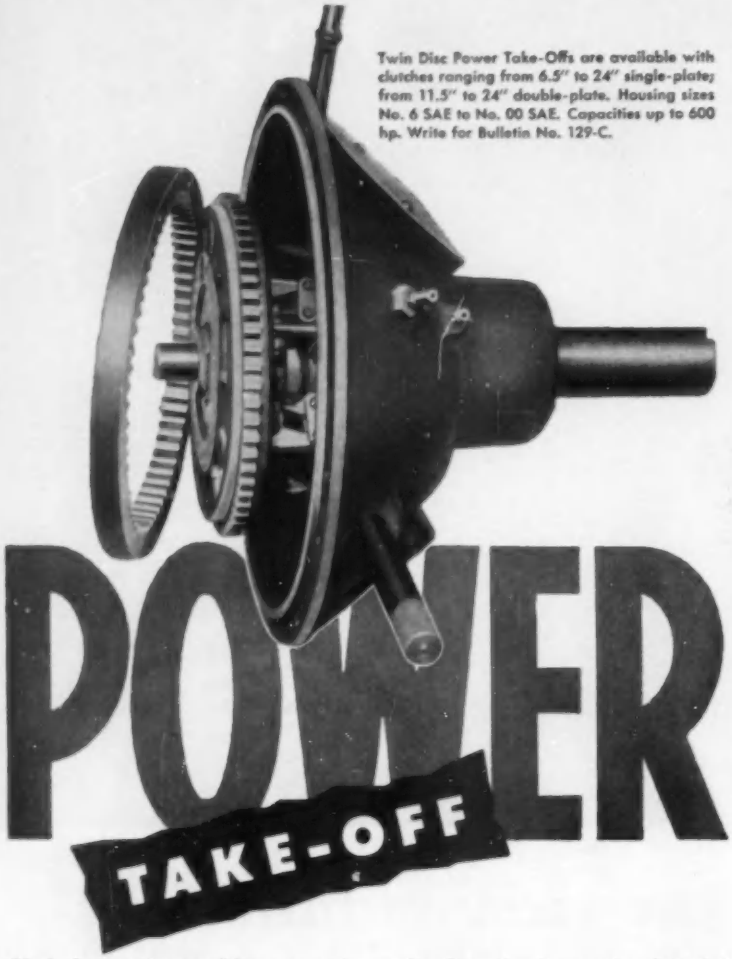
Precise, dependable *ElectroniK* instrumentation proves the ideal partner of this advanced metallurgical technique. These same qualities are equally valuable in literally any type of heat-treating application. Applicable to large furnaces or small . . . fuel fired or electrically heated . . . batch or continuous . . . these versatile instruments have earned an unmatched reputation for their ability to deliver top performance with absolute minimum maintenance.

For a discussion of your individual furnace instrumentation requirements, call your local Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Phila. 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA: Write for Catalog 54-1, "Furnace and Oven Controls."**

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls



Twin Disc Power Take-Offs are available with clutches ranging from 6.5" to 24" single-plate; from 11.5" to 24" double-plate. Housing sizes No. 6 SAE to No. 00 SAE. Capacities up to 600 hp. Write for Bulletin No. 129-C.

POWER TAKE-OFF

Next time you're watching powered equipment driving through a friction power take-off, check the name plate on the drive back of the engine. In all probability, you'll see a Twin Disc Power Take-Off, putting *more horsepower to work.* With their simple, *rugged* design—single-point adjustment—and slippage capacity far in *excess* of horsepower rating, *Twin Disc Power Take-Offs are selected as standard equipment by most of the nation's leading industrial engine manufacturers.*

That's why you'll find Twin Disc Power Take-Offs on such leading industrial engines as Ajax - Buda - Caterpillar - Climax - Continental - Cummins - Hercules - International - LeRoi - Minneapolis-Moline - Murphy - Superior - Waukesha - White - Wisconsin . . . for these manufacturers know they can depend on Twin Disc performance . . . and they know, too, that wherever their engines may be ultimately working, Twin Disc Service will only be a matter of hours . . . backed by 60 Parts Stations and 8 Factory Branches or Sales Eng. Offices.

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Seattle • Tulsa

All TABLOID

(*Continued from page* 106)

Arrangements have been completed to sell British-built Fordson Major tractors in Western Germany.

* * *

The Army is reportedly setting up a new "Land Locomotion Laboratory." Prime purpose will be to work with the automotive industries to accumulate data on the relationship between a military vehicle and the terrain over which it is to operate.

* * *

General Electric Co. is manufacturing airborne radar for control and coordination of fighter interceptor missions.

* * *

Dorsey Trailers has introduced a new aluminum high-cube van with more than 2275 cu ft of space in a 35-ft tandem model. . . . Galion Allsteel Body Co. has announced a new hydraulic end loader of 1100 lb capacity for mounting on ½ to one-ton trucks.

* * *

Westinghouse Electric Corp. reportedly will proceed with development of jet engines, even after its military orders expire.

* * *

Mattison Machine Works has set up a "Grinding Methods Laboratory" as a new service to metalworking plants.

* * *

American Society for Metals has become a member of the Atomic Industrial Forum, Inc. The latter has released a report predicting that industry will spend $300 million on atomic energy research during the next four years.

* * *

U. S. Rubber Co. is planning to double the size of its foam rubber plant in Santa Ana, Calif.

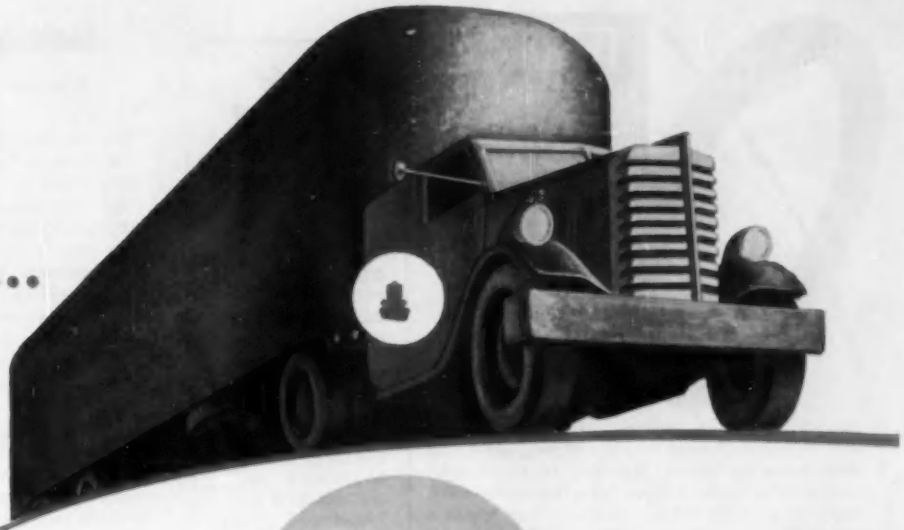
* * *

Clark Equipment Co. now has available prints of a film on its Mobilvan System.

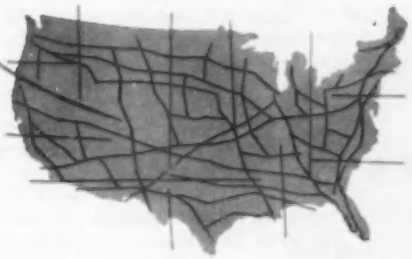
* * *

Inland Steel Co., Chicago, is planning a construction program which will increase steel-making capacity at its Indiana Harbor, Inc., works by 200,000 tons a year to 5.2 million tons in early 1956.

IN DUAL FUEL SYSTEMS...



a little control goes a long way



Millions of trouble-free highway miles over rugged terrain, in all kinds of weather—subject to all the vibration, shock and temperatures you'd expect in a heavy-duty tractor and trailer haul . . . that's the performance record racked up by General Controls PV Series gasoline and LP gas shut-off valves . . . and they can take it. These valves were originally designed to stand up under the impact of Hi-G stresses—so they offer a bonus margin of safety factors far beyond the usual field requirements.

Continuous duty solenoids, soft-seated valves, and other high performance features assure faultless operation at 10 psi for gasoline and 300 psi for LP gas.

Normally closed. Perfect operation in any position.

When *you* convert be safe . . . be efficient . . . be economical . . . be *sure* with dependable General Controls valves.

General Controls

hi-g controls

GENERAL CONTROLS

Glendale, Calif., Burbank, Calif., Skokie, Ill.

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 40 PRINCIPAL CITIES
See your classified telephone directory

TETRASEAL
RECTANGULAR-SECTION
RING
BY
GOSHEN RUBBER

this may be the **SEAL** *for* **YOU**

This safe, sure, low-cost seal may save you money and grief over the type you are now using . . . in static, and in some cases moving applications. TETRASEAL rectangular-section rings by Goshen are non-laminated (in one homogeneous piece). Edges are accurately formed, and cross-sectional tolerances can be held to ± .004 depending on inside and outside diameter, on size of cross-section and on material desired. Now available in materials to meet MIL, AMS and commercial specifications. To find out what TETRASEAL can do for you, write for Technical Bulletin No. 11.

See our "Facilities" catalog in Sweet's Product Design File.

Goshen Rubber Co. INC. *Goshen, Ind.*
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GET GOING WITH GOSHEN

you *Can't* automate . . .

. . . thinking. It's true you can punch figures into electronic brains and get fast, accurate answers. But they're only an aid to CREATIVE thinking, which can't be pushbutton operated.

Neither can Pioneer's engineers, but they can design, process and automate production of the finest pushbuttons as well as autos, home appliances, engines, machinery, etc.

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Indianapolis "500"

(*Continued from page* 57)

Tire testing by Firestone last year was done at higher speeds than ever before and the results were undoubtedly translated into higher practice and qualifying speeds by several cars this year.

Mechanical failures in the 1955 race were not too prevalent. Noteworthy were two instances in which connecting rods let go but neither was a primary failure of the rod proper — if post mortem analyses were accurate. The lower temperatures prevailing apparently minimized magneto difficulties. Only two such reports were received by this observer. Several cases of fuel system troubles were encountered—probably involving pumps. Since cars seldom are torn down by the time this analysis is prepared the word *probably* is indicated.

Several engines suffered various structural deformations which resulted in oil leaks of punishing extent and one car had a failure of a fuel line fitting but was able to finish the race after repairs were made. Statistically, the number of cars wrecked or otherwise eliminated distorts the outlook toward mechanical troubles. One new one, at least to this chronicler, was a broken transmission case, probably originating with some internal upheaval of bearings or gears. Perennially, there is one failure or rear axle gears. This year was no exception, although the actual trouble may have begun in a bearing or bearings.

One comment in closing may seem strange to those who may have been following these accounts in years past. It refers to color—seldom considered of interest in such columns. This fact notwithstanding, color today is of more than passing importance in all of our social and industrial activities. Bob Sweikert's car, in its tropical rose and cream colors, was by all odds the most color-attractive car at the track. If pleasing color schemes can be admitted to deserve any recognition in such hitherto two-fisted endeavors as automobile racing, this car rated a firm nod, although Pat O'Connor's car, in a geometric combination of cream and black, must also get a mention as the runner-up.

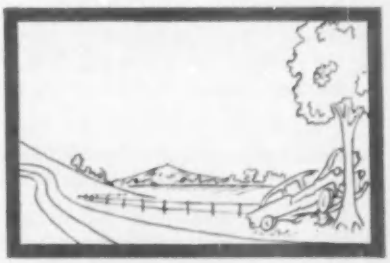
AUTOMOTIVE INDUSTRIES
Keeps You Informed

SOUND: Harp . . . off key

ANGEL: Hi! I'm a beginner. I checked out my harp and wings right after my accident. There I was, driving around . . . a nondescript generality. My brakes failed, and just like that . . . I'm a statistic! Now, I'm the one out of 3 whose brakes failed . . . and I'm one of the ones where it was fatal.

SOUND: Harp . . . strumming

ANGEL: It could happen to you. I knew brake failure was the greatest single mechanical cause of accidents; I also knew a better brake was available—Auto Specialties Double-Disc Brakes. I didn't do anything about it—and look what happened! I was braking my car down a mountain and when I got about three quarters of the way down, there was still plenty of mountain left . . . but I was out of brake. You could drive down two mountains and still have plenty of braking power left if you had Auto Specialties Double-Disc Brakes. I never asked for Auto Specialties Double-Disc Brakes. You still can.



SOUND: Harp

ANGEL: They cost about as much as power brakes. And believe me, they're a lot cheaper than a harp.

SOUND: Harp . . . up and out. ▲ ▲ ▲

In three successive trips down a mountain, a car equipped with Auto Specialties brakes had ample braking power in reserve. The *conventional* brakes, on another test car, faded completely after the first trip. Auto Specialties brakes do not "fade." They have no drums or shoes—are flat aluminum discs which run cool—do not distort. Auto Specialties brakes stop cars smoother, safer, quicker, and surer under all driving conditions.

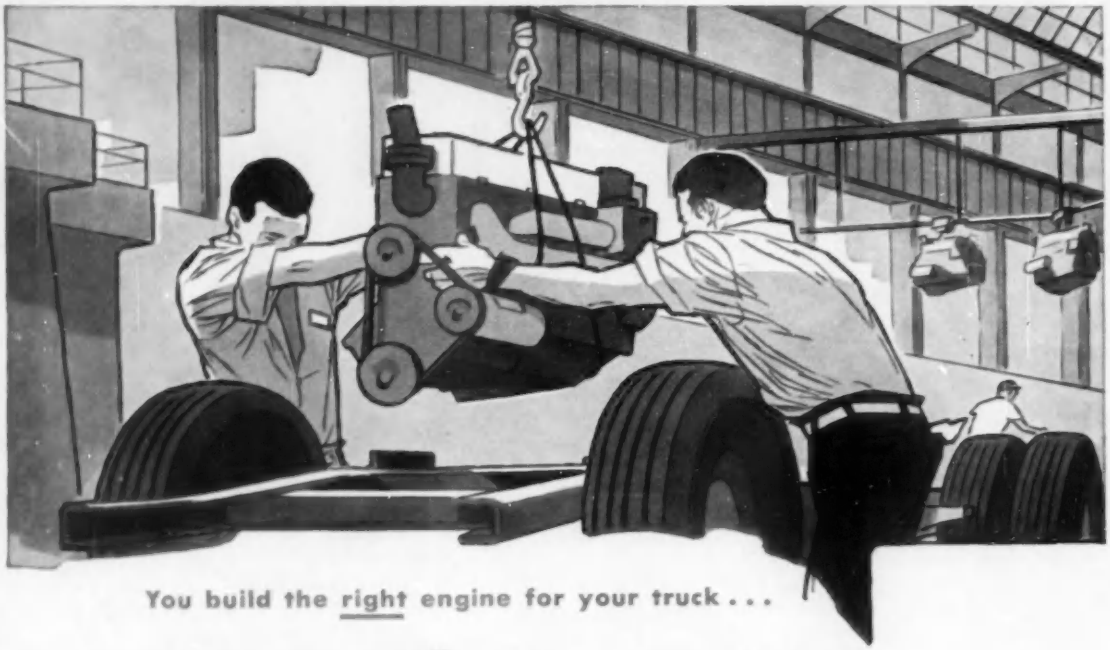
Auto Specialties Self-Energized Double-Disc Brakes have passed the severe testing of major car factories. Their cost is comparable to that of present automotive brakes. Their adoption will be in keeping with increased horsepower, speed and with the industry's continuing desire to give the American motorist better, safer and more pleasant means of transportation. For more information about these brakes, write:

AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Mich., and Windsor, Ont., Canada

Manufacturing for the automotive and farm machinery industry since 1908



You build the right engine for your truck . . .

Here's how to get the right heater, too!

Your heater, like the engine that goes into your truck, should be designed and built to your truck by experts.

Working with your engineers, our engineers will design and custom-build a heating unit to meet all your special truck requirements. The heater Evans engineers design will fit *right* for quick, easy installation. It will provide all the heat and fresh air needed for maximum driver safety and comfort, under any weather conditions.

Each Evans heater is built around a heavy-duty, continuous-service motor, an exclusive one-piece die-cast alloy fan and sturdy, fin and tube type core . . . all perfectly teamed for longest life with least maintenance.

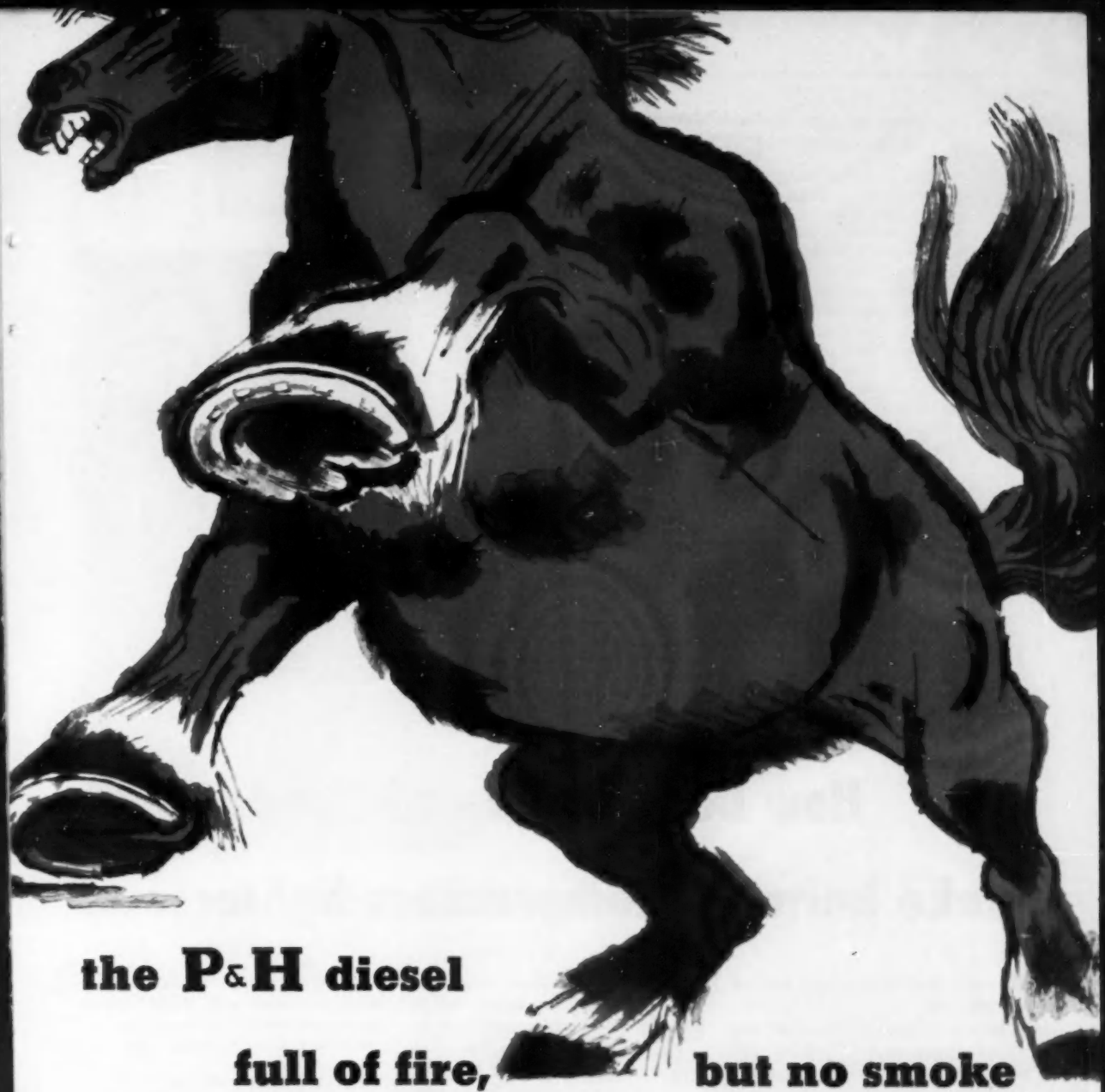
For your protection, every Evans heater also carries a parts "repair and replace" warranty good for one year or 50,000 miles, whichever comes first.

Phone or write to have an Evans engineering consultant call on you, at no charge. Or write for your free copy of the new Evans Heater Catalog to: Evans Products Co., Dept. P-6, Plymouth, Michigan.

EVANS
HEATERS AND VENTILATORS

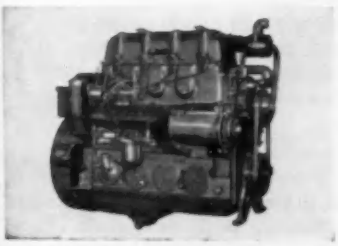
. . . Complete truck and bus systems . . . built right for the job

REGIONAL REPRESENTATIVES: Cleveland, Frank A. Chesa • Chicago, R. A. Lennox Co., Inc. • Detroit, Chas. F. Murray Sales Co. • Allentown, Pa., P. R. Weidner



the P&H diesel

full of fire, but no smoke



Series C-18 P&H automotive Diesels — now with *single*, fully self-contained fuel pump; perfect timing and balance for each cylinder. 30 *to* 280 horsepower, two-cycle, 2, 3, 4, 6-cylinder models, speeds up to 1800 r.p.m. Also stationary, marine and diesel-generating sets.

The better the combustion, the less the smoke — and the P&H is a *clean* diesel.

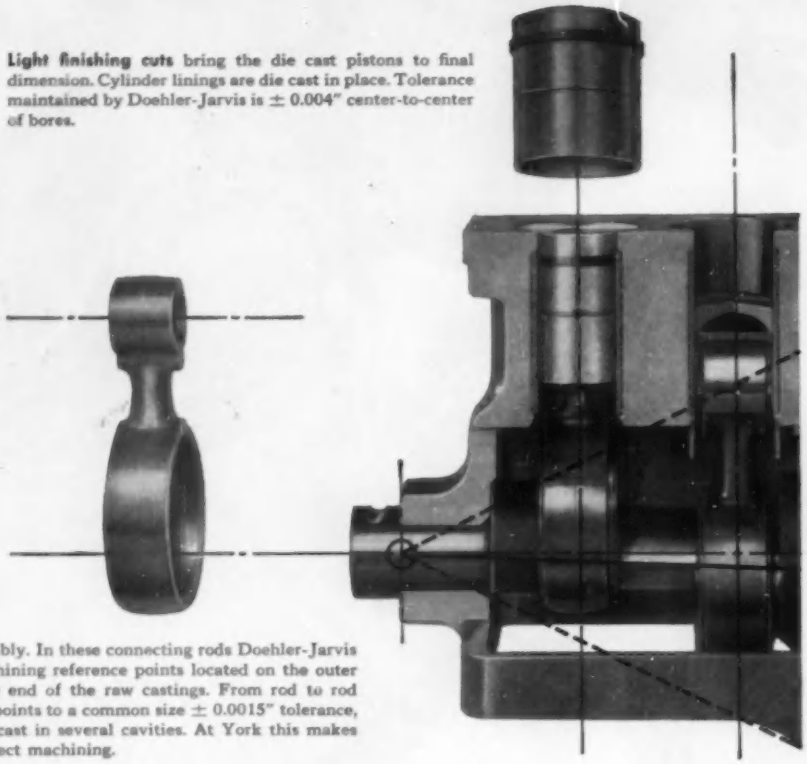
But check its efficiency in other ways. Cost per horsepower . . . it's the lowest of them all. *Weight* per horsepower . . . again the lowest. *Honest* horsepower . . . it's measured at the driveshaft where it all works for you.

Service? A P&H Diesel takes little of that. When it does, *how easy*. You can replace a whole cylinder assembly as a unit — in hours instead of days!

Quite an engine, this P&H Diesel . . . we'll be glad to send you the whole story. Write: P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.

HARNISCHFEGER

The P&H Line



Light finishing cuts bring the die cast pistons to final dimension. Cylinder linings are die cast in place. Tolerance maintained by Doehler-Jarvis is ± 0.004" center-to-center of bores.

Cast-in chamfers aid assembly. In these connecting rods Doehler-Jarvis dies also establish two machining reference points located on the outer circumference of the throw end of the raw castings. From rod to rod Doehler-Jarvis holds these points to a common size ± 0.0015" tolerance, even though they must be cast in several cavities. At York this makes for smooth, precise, low-reject machining.

How Doehler-Jarvis helped York make hermetic compressors lighter and

This is a story of practical product engineering.

Its concern is with things you may want for your product. Reduced size, weight, cost. Stepped up efficiency. Increased life. These were what York Corporation wanted for its post-war "packaged" air conditioners.

And at war's end, York was ready with a revolutionary, new hermetic compressor design. Small, simple, efficient. Aluminum for lightness. Now . . . how should it be made?

Cool! Light, small die cast compressors make York Window Conditioners compact, efficient and good for years of trouble-free service.

Three cost factors favor die casting

1. Raw castings cost less (less metal to buy)
2. Less machining was needed (less waste, fewer man-hours)
3. Tooling requirements were lower (fewer tools, lighter and less costly)

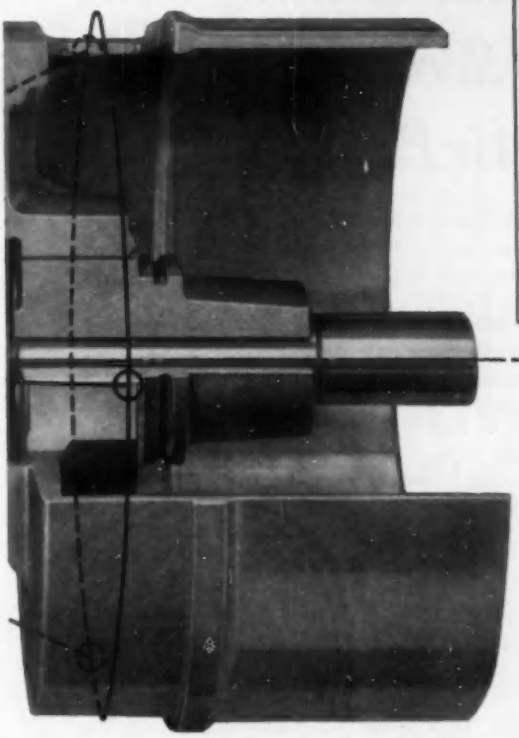
With these factors in mind, York took their two-cylinder, ¾ H.P. compressor* as a starter and went into production. Within a few years their whole line was converted to the new die cast design. Later . . .

York sees a way to cut size and weight even more

Doehler-Jarvis was asked to incorporate compressor and motor housing into a one-piece die cast unit. A series of conferences followed.

Together, engineers from both companies solved one problem after another. Precise dimensional control. Cast-in-place cylinder linings. Die cast bearing surfaces. Concentricity and precise location of cylinder center lines. (To solve this one, Doehler-Jarvis had to provide in the

**Test units, run continuously ever since, have logged over 70,000 hours without failure.*



"Phantom" control cone, with three "no tolerance" chucking surfaces, establishes precision

In the raw casting three equidistant chucking surfaces are established by the Doehler-Jarvis die. Their centers are located on a circle concentric with and exactly perpendicular to the shaft. The plane thus established forms the base of a "phantom" control cone (see illustration) whose apex is at the small bearing bore.

From this cone as a reference, all center lines and true surfaces throughout the piece are established. All machining setups, too, are based upon it.

At the Doehler-Jarvis plant, great care is taken to hold the chucking surfaces true. Aside from very slight variations in cooling, no tolerance is allowed. As a result, York machining proceeds smoothly with minimum rejects at every stage. What's more, the resulting precision insures long wearing bearings, long life pistons and cylinders.

more compact through die casting

die for three "no-tolerance" chucking surfaces on the raw casting . . . precisely located with respect to the front bearing bore.)

This expert product engineering team went on to develop for other sizes other integrated die cast housings, and the connecting rods, pistons, main bearings, and oil slinger rings. These compressors are light, compact and highly efficient. They can be produced quickly and easily.

"Cannot be matched for low cost," York says

"What's more, because the parts can be die cast in a hurry . . . and because Doehler-Jarvis never fails us on delivery . . . we stay flexible. We're able to meet peak demands for air conditioners without going overboard on finished inventory."

Come back to the things you want to do for your own product . . . maybe Doehler-Jarvis could help you do them with die castings. We've done it for scores of manufacturers, large and small—including makers of home appliances, office and public utilities equipment, industrial machines, and many other similar products made better with die castings.

So, if you are engineering a new product or improving the one you have, call in Doehler-Jarvis. With more than fifty years experience behind us, we may be able to contribute in many ways.

Doehler-Jarvis Division

of

National Lead Company

General Offices: Toledo 1, Ohio

AIRengineering at work
REPORT No. 4150.25

Cuts 60 Second Metal Drilling Job to 15 Seconds . . . with Air Punching Tool

A sub-contractor for a large auto manufacturer formerly used two men, an electric drill and a drilling jig to drill two ¼" holes in rear auto fenders.

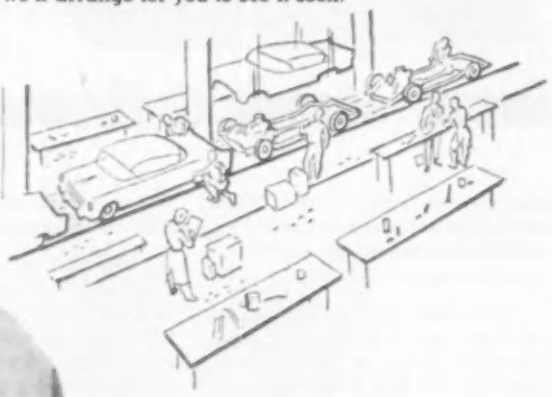
This method required a whole minute and failed to provide uniform results. In addition, paint damage and broken drills caused excess time loss.

AIRengineering by Ingersoll-Rand solved the problem fast. A size AR130 Air Buck Riveter was equipped with special yoke, punches and stripping mechanisms. The holes are now punched four times faster, with closer tolerances and only *one* man is required instead of two.

If you are in a position to encourage cost-savings in your plant, you should see I-R's confidential manual reports on "AIRengineering at Work". Write on your company letterhead and we'll arrange for you to see it soon.

AIRengineering Manual
Over 100 interesting and helpful case history applications of AIRengineering at work.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.



Air Buck Riveter
Punching two ¼" holes in rear auto fender.

B-257

Only FRONTIER
40-E Aluminum Alloy

with this composition* can give you these average properties

Zn —5.0 —6.0	Cu — .30 Max.
Mg — .50— .70	Si — .25 Max.
Cr — .40— .60	Mn — .30 Max.
Ti — .15— .25	Al —Remainder
Fe —1.0 Max.	

* Protected by Comstock Patent 2146330. Alloy Data Booklet will be mailed free, giving complete story on 40-E Alloy. Write for your copy — today!

Yield Point — 30,000 lbs.
Tensile Strength — 37,000 lbs.
Elongation . . . 5%
Shock Resistance — Withstands direct and transmitted shock
Corrosion Resistance even in stressed condition
Excellent Machineability
Fine Grain. Withstands High Pressure.
No Heat Treatment Necessary.

Here's what happens when attempts are made to develop an Aluminum-Magnesium-Zinc Alloy *without infringing on the FRONTIER 40-E Patent*

- Copper Increased . . . . RESULT: Embrittles the alloy, reduces the elongation and tensile strength and increases stress corrosion.
- Silicon Increased . . . . RESULT: Reduces all physical properties.
- Manganese Increased . . RESULT: As manganese is increased over 0.4% the elongation and tensile strength are relatively reduced.
- Tin Added . . . . . RESULT: Yield Point and Tensile Strength reduced.
- Lead Added . . . . . RESULT: Additions of even small fractions of a percent have a decided effect on reducing tensile and yield strength.

NO Al, Zn, Mg ALLOY CAN MATCH FRONTIER 40-E ALLOY

BECAUSE *"Almost"* JUST ISN'T GOOD ENOUGH

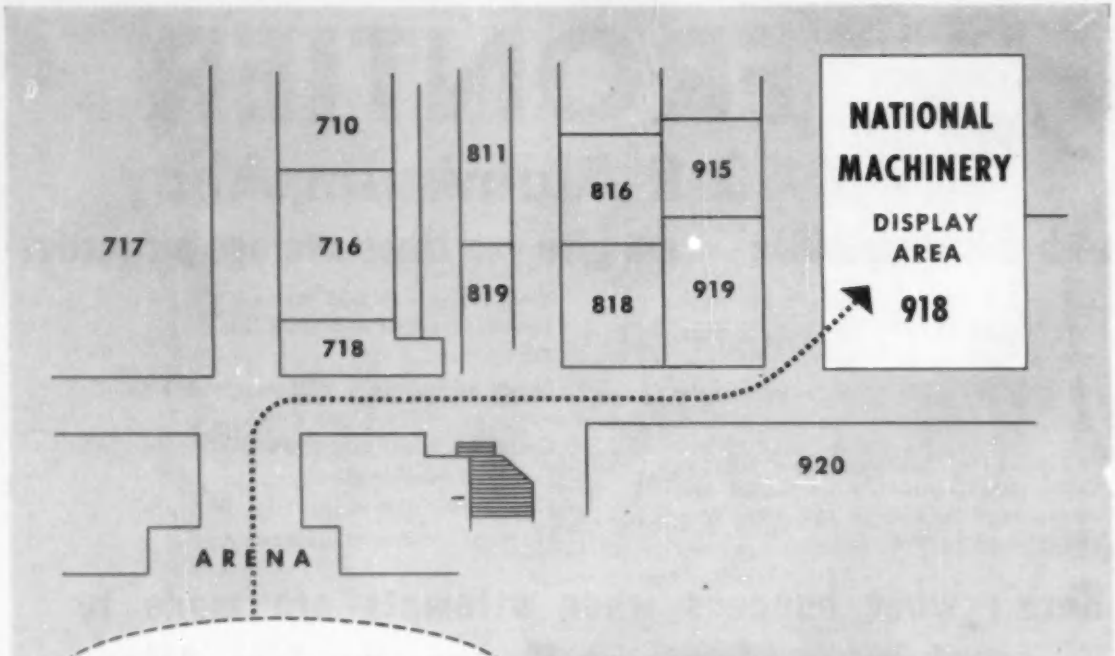
Use the BEST! Use FRONTIER 40-E

Technical Advice and Service is available to Designers and Licencees

FRONTIER BRONZE
CORPORATION
4885 PACKARD ROAD
NIAGARA FALLS, NEW YORK

Please send me a copy of the Alloy Data Book giving engineering and metallurgical Facts on the physical properties of Frontier "40-E".

Name .....
Company .....
Address .....
City ..... State .....



DISPLAY AREA 918 . . . PROGRESS IN FORGING

AT THE MACHINE TOOL SHOW,

CHICAGO, SEPTEMBER 6 TO 17!

We at National Machinery, WHQ*
for the development of advanced methods
and machinery for the forging industry,
for more economically producing
a wide variety of parts—
routine or unusual, ferrous or non-ferrous,
automatic or semi-automatic,
by cold forging or hot forging—
invite you to visit our working exhibit
at the coming machine tool show,
the first in seven years!

*WORLD HEADQUARTERS

NATIONAL
MACHINERY COMPANY

TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

For rolling pavements

or towing planes

take this TORQMATIC tip

THERE'S A big difference between these two pieces of equipment but they've got one thing in common—their Allison TORQMATIC Converter-Continental Engine team.

In the Galion Roll-O-Matic roller, TORQMATIC power transmission provides a complete hydraulic cushion that makes for really smooth pavements. It means no gears to shift, quicker pickup, 10% more work per day with fuel consumption cut as much as 25%.

And in the Unitow Industrial Tractor it means smoother, steadier towing of huge bombers and commercial planes —that will not damage even the most fragile nose-wheel strut.

Allison's small, compact, *completely self-contained* 200-300 Series TORQMATIC Converters fit *both* gasoline and Diesel engines in the 40 to 150 horsepower range. They bring shock-free power transmission to a wide range of equipment—protect the entire drive line from harmful shock loads. They more than *triple* engine torque—broaden the engine's working horsepower range.

These converters are easy to maintain, too. They carry their own oil supply—have a simple dip stick to check oil level. They are the first complete converter package in these sizes on the market with integral oil cooler, sump and charging pumps. Many model options including front or rear disconnect clutches, governor drives and optional flanges designed to meet most installation requirements are available.

You can *specify* Allison TORQMATIC Converters or Transmissions in a wide range of equipment from road rollers to giant off-highway trucks. Ask your equipment dealer or manufacturer about TORQMATIC DRIVES next time you buy, or write direct for more complete information. Allison Division of General Motors, Box 894A, Indianapolis 6, Indiana.

GM TORQMATIC

Allison

TORQMATIC DRIVES

MBI

• greater production
• lower costs
• smaller investment

PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

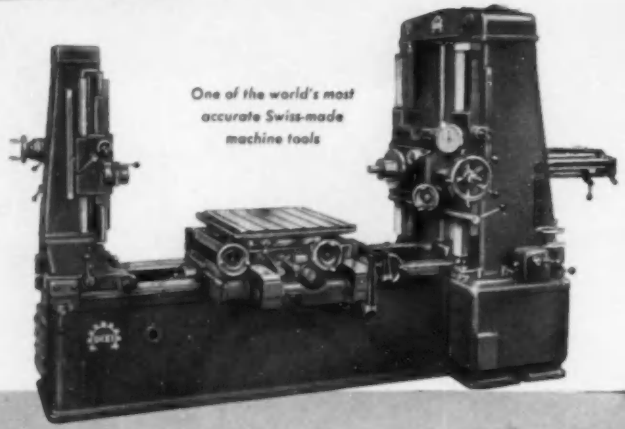
Dixi 60 Combination

Horizontal Boring Mill & Jig Borer

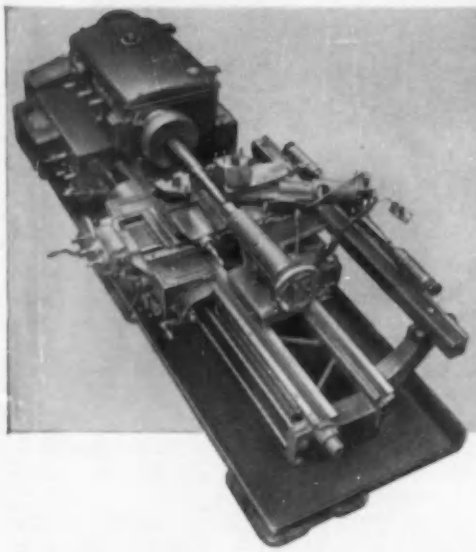
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅛". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare parts in Stock*
- *Your Operators Trained*
- *Early Deliveries — Some from Stock*
- *Competitive Prices*
- *Financing and Rental Plans to Meet Your Requirements*

Many More Machines for Every Operation
Write for free illustrated brochure 100, or state your specific requirements

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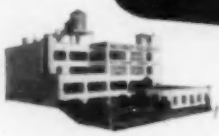
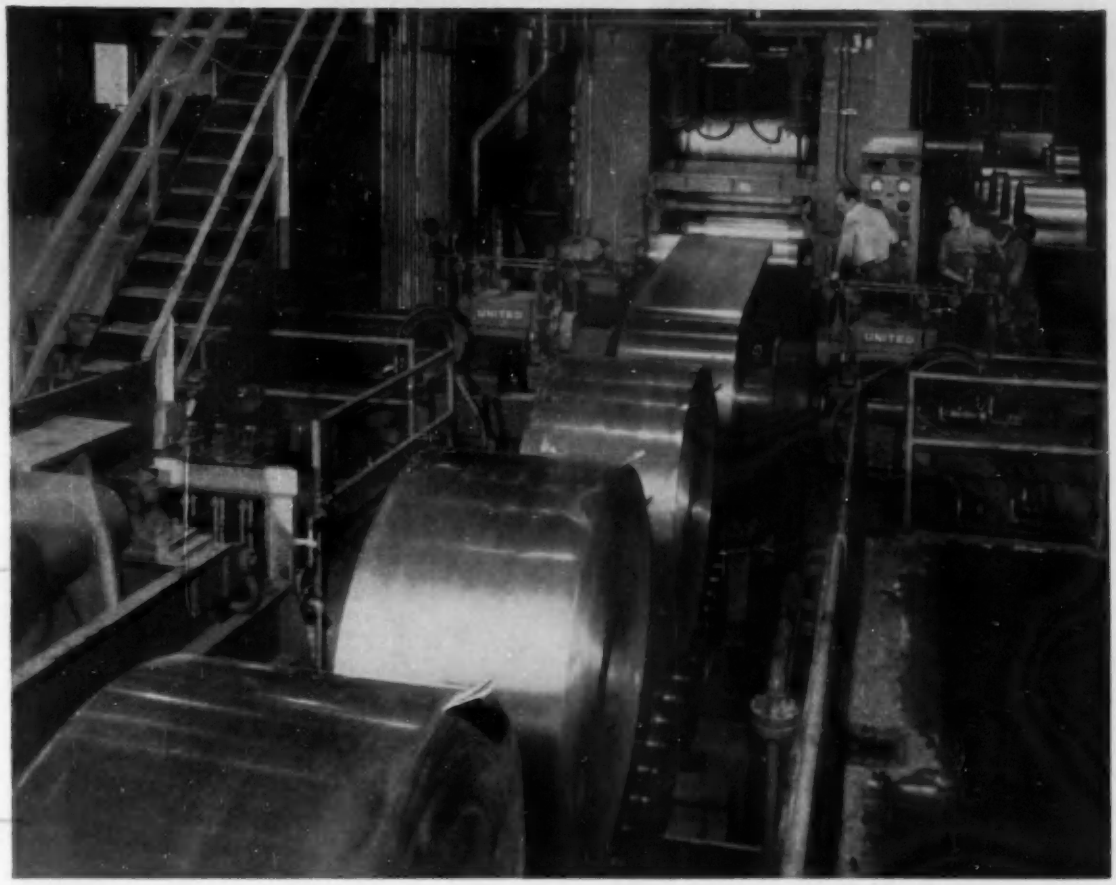


Our Headquarters in New York City

Let's discuss your requirements NOW for cold rolled sheets and strip



Tempering sheets in our new cold-rolled mill, Indiana Harbor Works, East Chicago, Ind.

●Our new continuous cold-reduced mill at East Chicago is turning out the finest sheets and strip that modern equipment can produce. And we are running on a full schedule to meet the heavy demand.

But more and more customers want more and more sheets. Our output is booked for weeks ahead, so you can help us to help you by letting us know your requirements right away.

Let's discuss your sheet and strip problems. Call our nearest District Sales Office now.

QUALITY YOUNGSTOWN SERVICE

Youngstown

COLD ROLLED SHEETS AND STRIP

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steels

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

CHARLES R. COX

Portrait by Fabian Bachrach

"I urge every executive..."

"I know of no better method for each citizen to protect the American way of life than by building his own economic security and by helping his Government to keep financially sound. Both these results can be accomplished through the Payroll Savings Plan. I urge every executive in the nation to give this Plan his active and vigorous support."

CHARLES R. COX, ***President, Kennecott Copper Corporation***

With the active cooperation of Mr. Cox, Kennecott conducted a person-to-person canvass which put a Payroll Savings Application in the hands of *every* one of Kennecott's 20,000 employees. The men and women of Kennecott did the rest. Country-wide participation in Kennecott's Payroll Plan rose from 24% to 52%.

Your State Director, U. S. Treasury Department, is ready to help you install a Payroll Savings Plan, or show you how to build participation in an existing Plan through a simple person-to-person canvass. Write today to Savings Bonds Division, U. S. Treasury Department, Washington, D. C.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

AUTOMOTIVE INDUSTRIES

DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

Henry Disston & Sons, Inc., Steel Sales Division
631 Tacony, Philadelphia 35, Pa., U.S.A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING

THE NEW TREND IN ADVERTISING

...*Makes Us Expand*

MAYBE YOU haven't yet spotted the new trend in advertising. It is the trend to supplement advertising to *people in the mass* with *selective* advertising to *prospects* — the people most likely to buy.

It is a growing trend, because today's fierce competition is forcing it. More and more national advertisers and their agencies are finding that this kind of advertising makes their advertising dollars work harder.

Through continuing research and experience they are finding that advertisements mailed to individual prospects escape competition for attention . . . win far higher readership than any other form of printed advertising . . . permit telling a complete sales story . . . pay off in measurable sales results.

Because R. L. Polk & Co. has *complete* national publishing facilities in the selective advertising field, we are right in the middle of this trend. It has caused us recently to add this big new plant to our Detroit facilities.

Here we carefully prepare the hundreds of different selective circulation lists our clients require. Here daily we can receive two million individual advertisements, imprint them with dealers' identification, address them and mail them to the selected prospects of many of America's largest advertisers.

You will find it worth while to know more about the new advertising trend and about our *selective circulation* medium — particularly about what it can do for you. We have some interesting facts to show you. Please write us.

R·L·POLK & CO.
PUBLISHERS

POLK BUILDING • 431 HOWARD STREET • DETROIT 31, MICHIGAN

3 IMPORTANT ADVANTAGES FROM LORD CENTER BONDED ENGINE MOUNTINGS

Constant power increases and performance requirements have multiplied the demand for more effective mountings for heavy-duty automotive engine systems. LORD Center-Bonded Mountings were specifically designed to meet these requirements and provide these important advantages . . .

LOWER COST—LORD Center-Bonded Mountings provide lower initial and service-life cost through standardization in manufacture and greatly increased capacity to withstand severe use.

LONGER PERFORMANCE LIFE—LORD Center-Bonded Mountings outlast other mountings of more costly design. The one-piece construction (using live rubber bonded to metal) provides precision fit and increases capacity to reduce level of noise and absorb vibrations and stresses.

IMPROVED DESIGN—LORD developments in this mounting design have resulted in more effective shock and vibration control, noise isolation, and accommodation for misalignment.

All these advantages add up to better shock, vibration, and noise control for your automotive power plant—with LORD Center-Bonded Mountings. For detailed information contact the LORD Field Engineer nearest you or

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DALLAS, TEXAS - Riverside 3392 • LOS ANGELES, CAL. - HOllywood 4-7593
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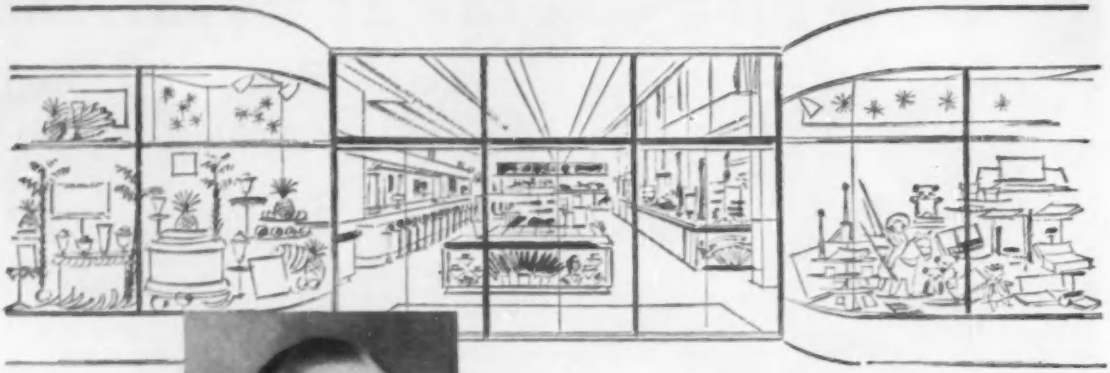
LORD BONDED RUBBER

DESIGNERS AND PRODUCERS OF BONDED RUBBER PRODUCTS SINCE 1924

S. S. KRESGE CO.



F. P. Williams, President
S. S. Kresge Company

"The key men and women of our organization

regularly and thoroughly read Business Publications ...especially articles covering business trends in merchandise and developments in the retail variety field."

To carry Mr. Williams' thought a step further, men and women who have to keep their thinking a step ahead of their work have one common characteristic. They read thoroughly the publications that give them the most help.

Just as the Kresge executives follow their business publications for trends and developments in the lines of their special interests, so leaders in every field of business and professional activity study each issue of the business periodicals in their own fields.

Such regular and thorough reading is a tribute to the ability of editors and special writers to think in terms of tomorrow. Regular and thorough readership means, too, that *the advertising pages of the Business Press form a direct sales channel for products and services that are sold to business and professional men.*

NBP

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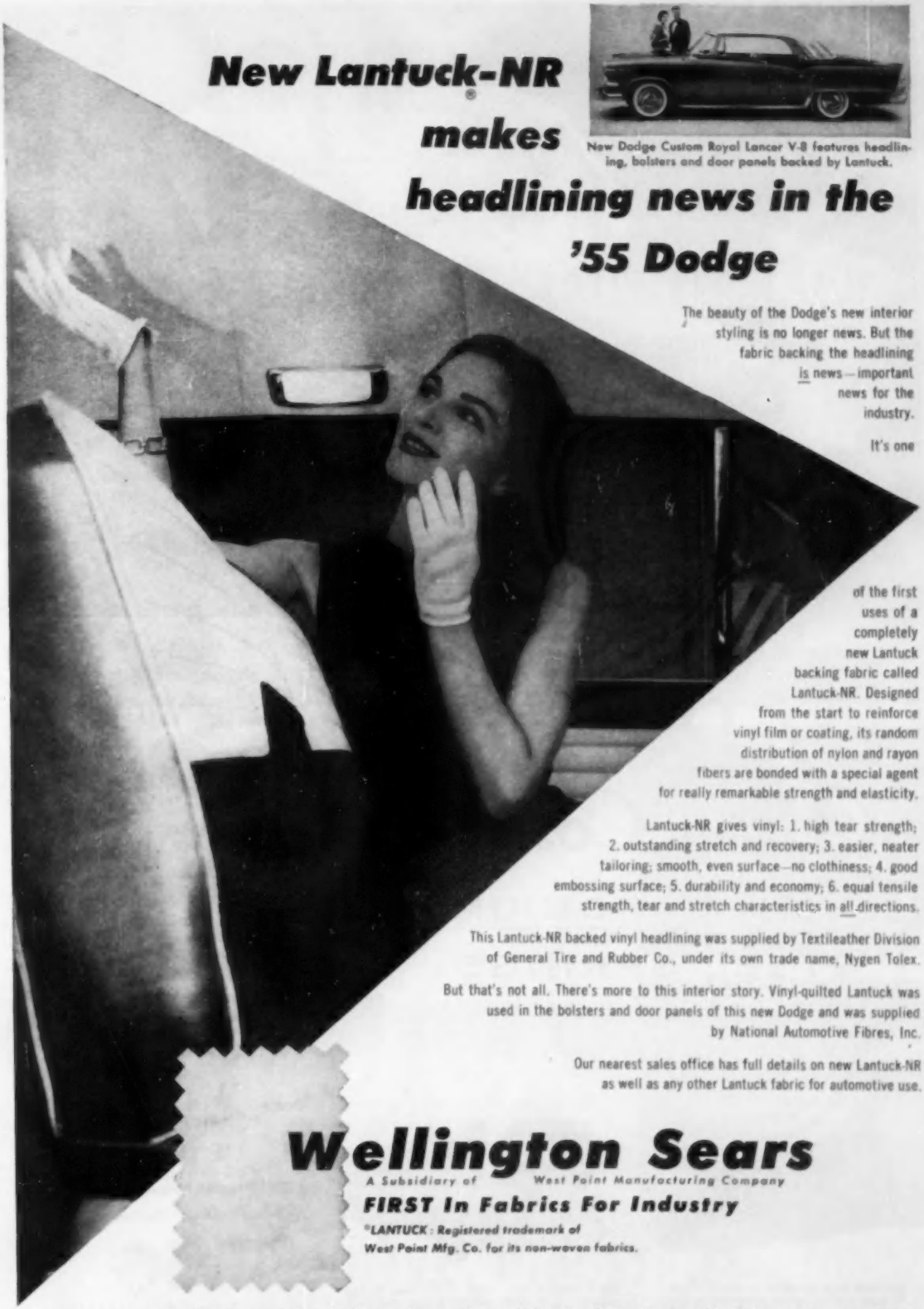
The national association of publishers of 165 technical, professional, scientific, industrial, merchandising and marketing magazines, having a combined circulation of 3,849,056... audited by either the Audit Bureau of Circulations or Business Publications Audit of Circulation, Inc.... serving and promoting the Business Press of America... bringing thousands of pages of specialized know-how and advertising to the men who make decisions in the businesses, industries, sciences and professions... pin-pointing your audience in the market of your choice. Write for list of NBP publications and the latest "Here's How" booklet, "How We Use the Business Press and Why" by William C. Sproull, Director of Advertising of the Burroughs Corp., Detroit.

New Lantuck®-NR makes headlining news in the '55 Dodge

New Dodge Custom Royal Lancer V-8 features headlining, bolsters and door panels backed by Lantuck.



The beauty of the Dodge's new interior styling is no longer news. But the fabric backing the headlining is news—important news for the industry.

It's one of the first uses of a completely new Lantuck backing fabric called Lantuck-NR. Designed from the start to reinforce vinyl film or coating, its random distribution of nylon and rayon fibers are bonded with a special agent for really remarkable strength and elasticity.

Lantuck-NR gives vinyl: 1. high tear strength; 2. outstanding stretch and recovery; 3. easier, neater tailoring; smooth, even surface—no clothiness; 4. good embossing surface; 5. durability and economy; 6. equal tensile strength, tear and stretch characteristics in all directions.

This Lantuck-NR backed vinyl headlining was supplied by Textileather Division of General Tire and Rubber Co., under its own trade name, Nygen Tolex.

But that's not all. There's more to this interior story. Vinyl-quilted Lantuck was used in the bolsters and door panels of this new Dodge and was supplied by National Automotive Fibres, Inc.

Our nearest sales office has full details on new Lantuck-NR as well as any other Lantuck fabric for automotive use.

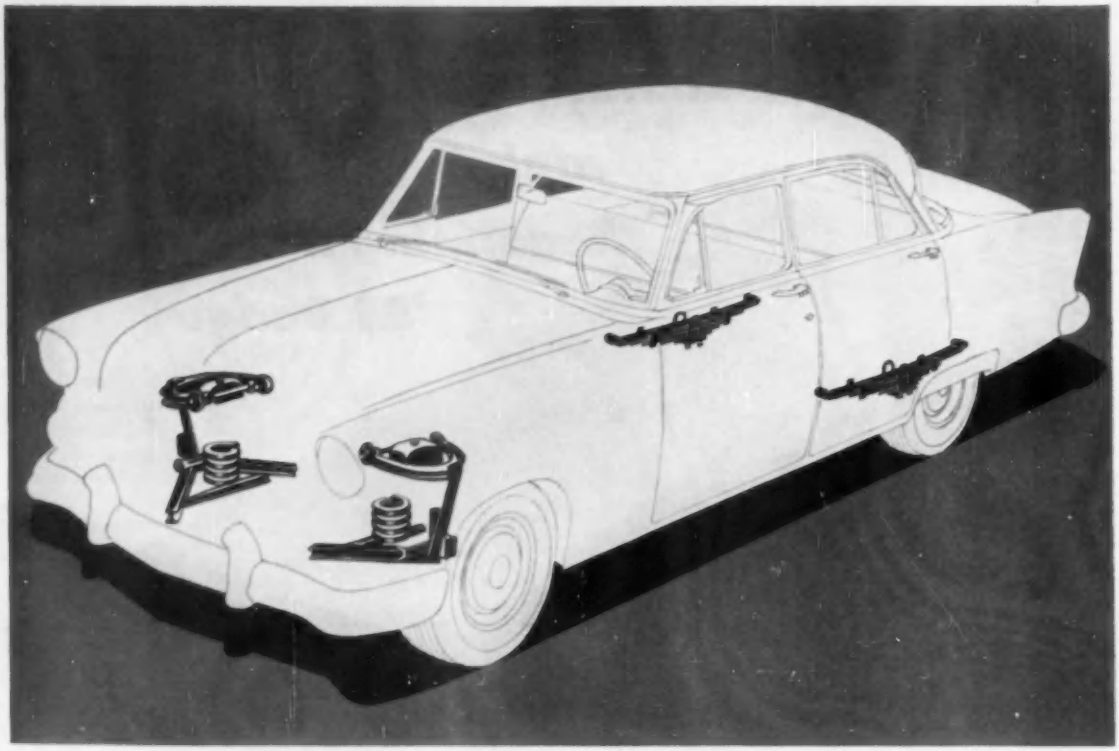
Wellington Sears

A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

®LANTUCK: Registered trademark of West Point Mfg. Co. for its non-woven fabrics.

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis



Roll Down Costs

WITH CHROMIUM STEEL SPRINGS

Roll up comfort and long life, too.

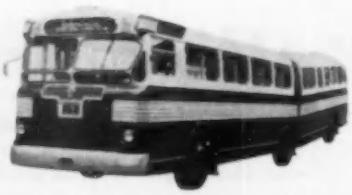
Service records prove these springs strong . . . tough . . . and highly resistant to fatigue. That's why about 75% of all automotive coil and leaf springs are made today of chromium steels.

They're ideal for light trucks as well, where safety and long life are essential.

In heavy-duty trucks and buses, springs of Chromium-Vanadium steel roll down cost per mile. The fine grain structure of this steel permits higher operating stresses . . . maximum flexibility with long, trouble-free life.

Make sure you specify Chromium steel springs. They have proved their superiority through years of successful service.

No ch-chuck hole ch-chuck to damage cargo. CR-V steel springs mean long-run economy in handling as well as in operating costs.



No b-bounce here with CR-V leaf springs. Chassis and body maintenance are down, and passenger comfort way up.

VANADIUM CORPORATION OF AMERICA

420 Lexington Ave., New York 17, N.Y.

Detroit • Chicago • Pittsburgh • Cleveland

VANCORAM

Producers of alloys, metals and chemicals

AUTOMOTIVE INDUSTRIES

MACHINE TOOL and PRODUCTION EQUIPMENT ISSUE

SEPTEMBER 1, 1955

This impressive issue will be mailed August 30th to reach readers before show time. And . . . 56% of A.I. subscriptions are home addressed, assuring intensive pre-show readership.

DEVOTED EDITORIALLY TO THESE THREE MAJOR SHOWS . . . . . .

Automotive and aviation executives attending these shows will have a timely preview of the outstanding new equipment on exhibition, with a special section keyed to each show. For those unable to attend, the Machine Tool and Production Equipment Issue will be a valuable "show in print."

MACHINE TOOL SHOW

PRODUCTION ENGINEERING SHOW

COLISEUM MACHINERY SHOW

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THE NEWS MAGAZINE OF AUTOMOTIVE and AVIATION MANUFACTURING

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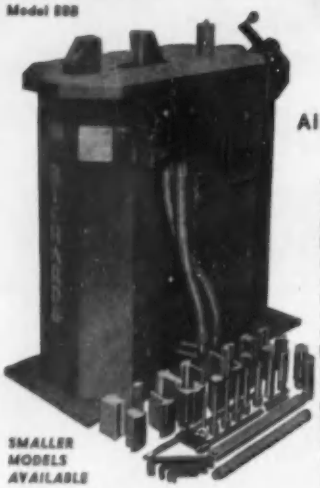
Model 888



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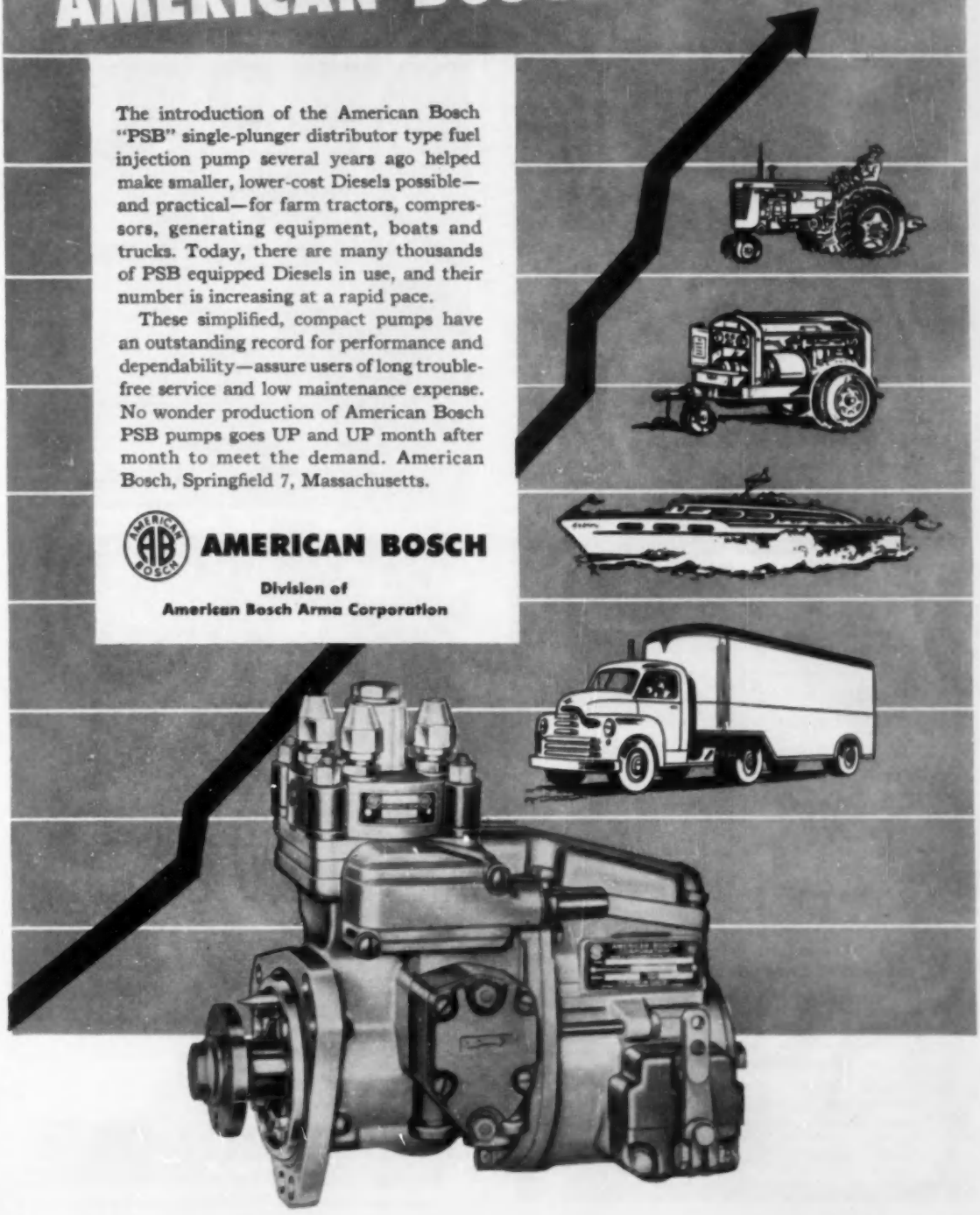

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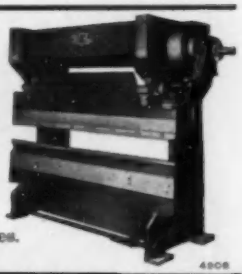

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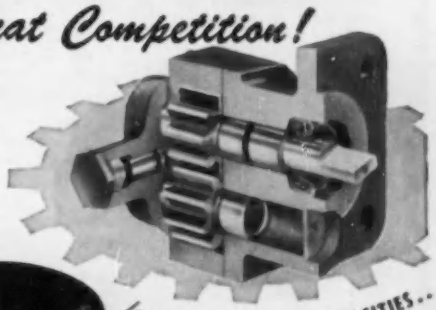

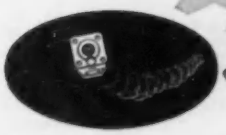

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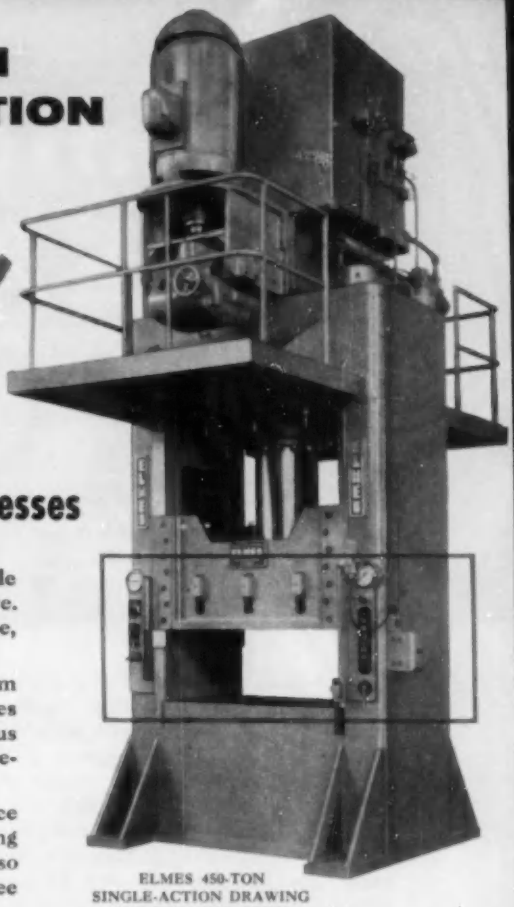

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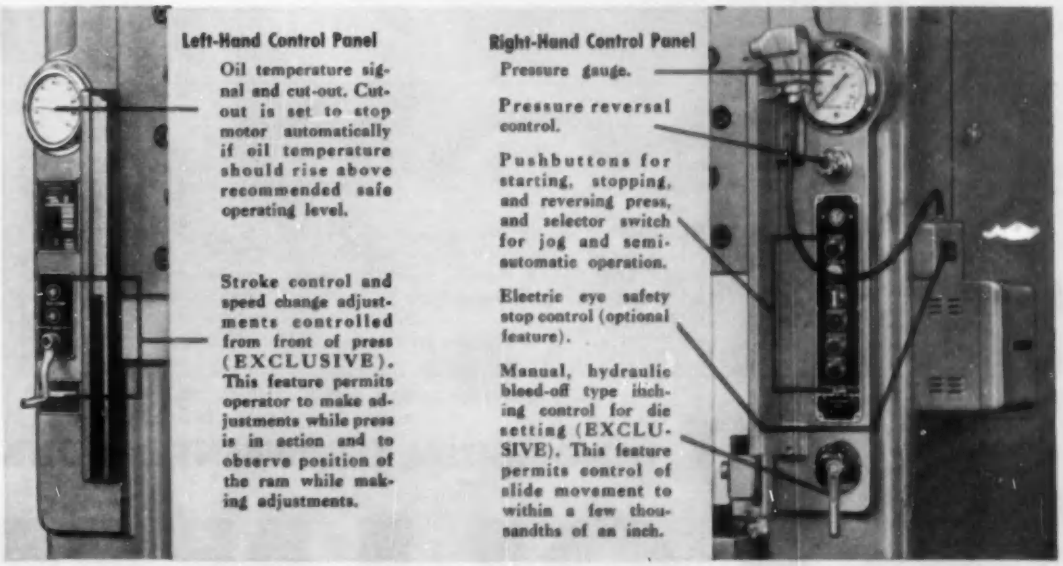
Elmes engineers have the long and specialized experience that is all-essential for helping you solve your metal-pressing problems to the *best* advantage. And they're ready to do so at all times. For recommendations and cost estimates, see your Elmes Distributor, or write to us direct.



Left-Hand Control Panel

Oil temperature signal and cut-out. Cut-out is set to stop motor automatically if oil temperature should rise above recommended safe operating level.

Stroke control and speed change adjustments controlled from front of press (EXCLUSIVE). This feature permits operator to make adjustments while press is in action and to observe position of the ram while making adjustments.

Right-Hand Control Panel

Pressure gauge.

Pressure reversal control.

Pushbuttons for starting, stopping, and reversing press, and selector switch for jog and semi-automatic operation.

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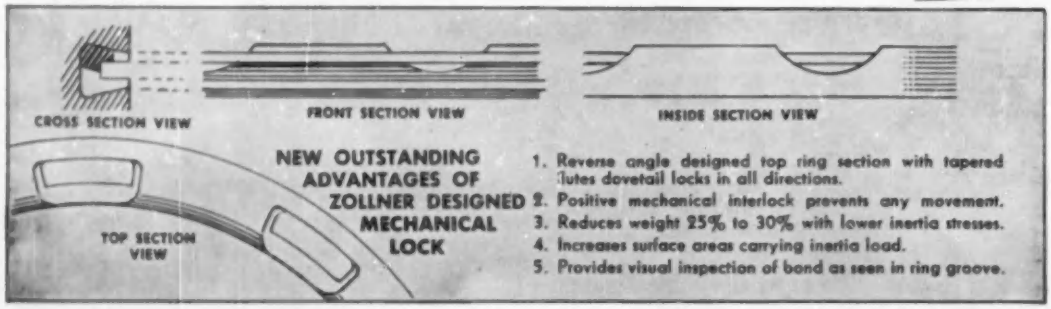

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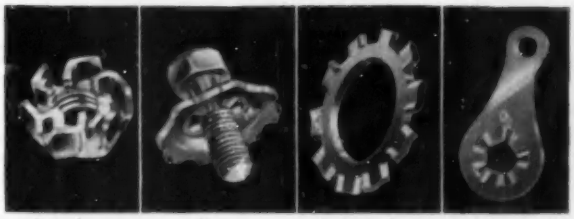

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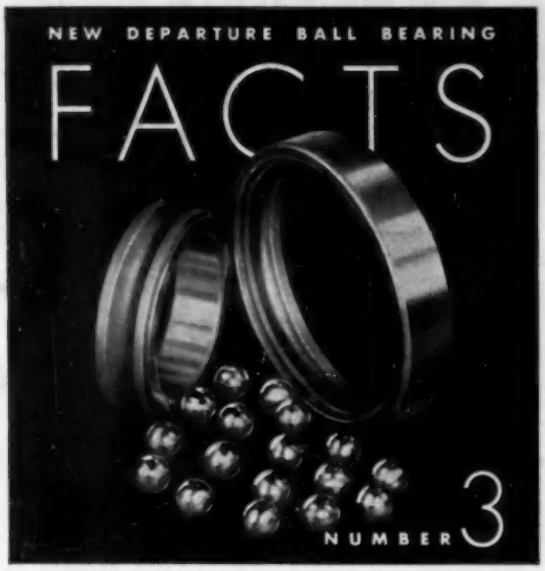
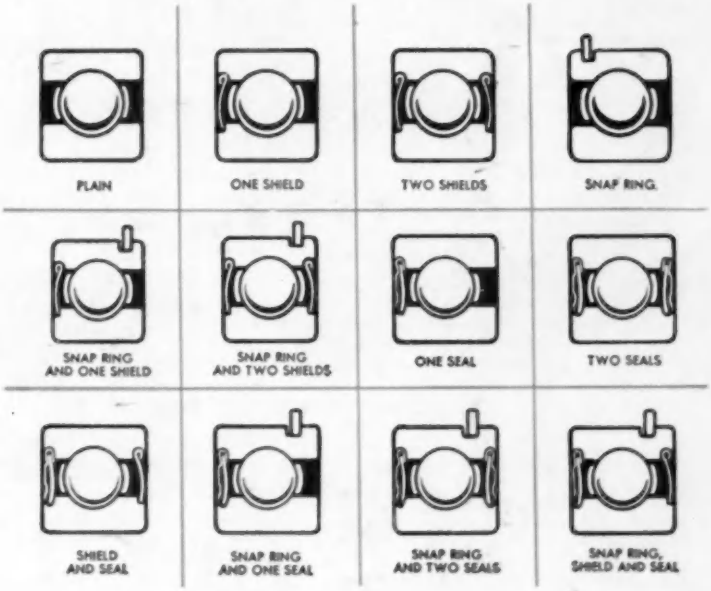


This "wardrobe" fits standard ball bearings to CUSTOM OCCASIONS

Versatile is the word for New Departure standard ball bearings! For these bearings may be obtained in a wide range of *standard* variations (as shown below), opening a tremendous range of uses to the engineer. In other words, a standard bearing has a "wardrobe" which fits it for very nearly any occasion!

New Departure Single Row Conrad-type bearings, with standard variations available, illustrate the "wardrobe" principle which makes these ball bearings, with their dual load-carrying ability, the most readily adaptable of all bearing types.



Virtually any mounting or operating requirement within a wide range of usage is met perfectly by a *standard* New Departure ball bearing, in conjunction with shields, seals, snap ring, or combinations thereof. Shields protect the bearing from ordinary dirt both before and after mounting and, in many cases, provide adequate retention of lubricant. Seals give positive protection against dirt of every kind and make possible enclosed lubrication for extended or even lifetime service. Snap rings allow positive location in housings lacking inside shoulders. Whenever a design or engineering problem involves ball bearings, think of New Departure. Highly experienced ball bearing engineers are always ready to work with you.

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